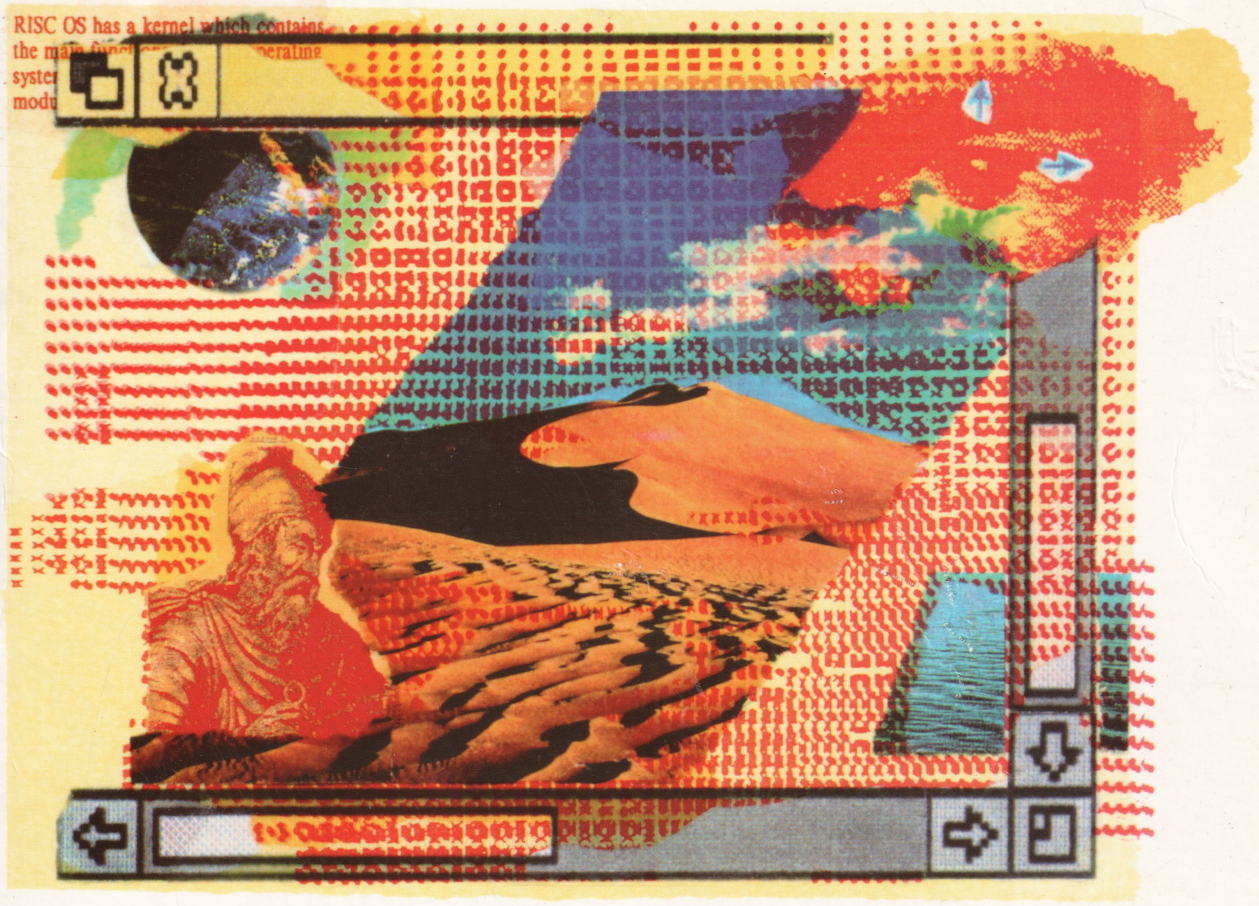
RISC OS 3
Applications Guide



Acorn

RISC OS 3

Applications Guide

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Introducing the Applications Suite

This guide describes the suite of applications provided with RISC OS 3. Some additional applications (detailed below), which are also supplied and are closely related to the functioning of the operating system, are described in the RISC OS 3 *User Guide*.

The Applications Suite is a set of programs that introduces you to some of the capabilities of your RISC OS computer (and which are useful and powerful utilities in their own right). Some of the applications are stored permanently inside your computer, and do not have to be loaded from a disc; these are sometimes called ROM applications, since they are stored in the computer's ROM (Read-Only Memory). You can view these applications by clicking Select on the **Apps** icon on the icon bar.

Most of the rest of the Applications Suite is supplied on two Applications directories, App1 and App2.

Each of the applications supplied is covered by a separate chapter in the Guide. Next to the title of each chapter we print either the Apps icon, or a picture of a directory or disc, to indicate where the application is to be found.

Additional applications can also be found on the floppy disc labelled Support.

This Guide assumes that you are familiar with the mouse and with the general features of the desktop, such as windows, icons and menus. These are described in the RISC OS 3 *User Guide* and in the *Welcome Guide* supplied with your computer.

The Applications Suite

Major applications

Four major applications are included:

- *Edit* – a text editor
- *Draw* – a drawing program
- *Paint* – a painting program
- *Maestro* – a music composition program, which enables you to transcribe and play music in up to eight voices.

Desktop tools

Eight desktop tools are included:

- *Alarm* – a versatile alarm clock
- *Calc* – a simple four-function calculator
- *Chars* – enabling you to use special characters that are normally not available on the keyboard
- *Clock* – an analogue clock face
- *Help* – providing context-sensitive help on the desktop
- *Magnifier* – enlarging a portion of the screen
- *SciCalc* – a calculator incorporating scientific functions.
- *Change*FSI – an image conversion program that converts image files created on other systems into sprite files for use with the Paint application.

Emulators

Two applications which enable you to run BBC Model B software:

- *65Host* – emulating a BBC B Microcomputer
- *65Tube* – emulating a 65C02 second processor attached to a BBC B Microcomputer.

Utilities

Nine utilities are included to assist your productivity:

- *PrintEdit* – allowing you to set up your own particular printer configuration for use with the Printer Manager
- *SetIcons* – defining which set of desktop icons are to be displayed
- *Squash* – a file compressor, enabling you to fit more files on your discs
- *TinyDirs* – the desktop filing utility
- *Usage* – enabling you to observe the processor activity of your computer
- *AlarmConv* – converting old Alarm data files into the new format used by the Alarm application
- *TVTest* – a TV test card, useful for setting up monitors and televisions
- *HForm* – a utility that lets you format your hard disc
- *T1ToFont* – allows you to convert Adobe Type 1 fonts into Acorn Outline fonts.

Games

Finally, if some of these seem a bit too serious, three programs are provided for your entertainment:

- *Patience* – the familiar one-player card game
- *Puzzle* – another test of skill and patience
- *Madness* – a more passive amusement.

Applications described in the *RISC OS 3 User Guide*

The following programs, although included as part of the Applications Suite, are described in the RISC OS 3 *User Guide*, as they are closely associated with the operating system:

- *Configure* – an easy way of changing some of the settings used when the machine is switched on; how loud the beep sounds, for instance.
- *HForm* – to format a variety of hard discs.
- *Printers* – the Printer manager described in the chapter *Printing*, enabling you to print your work on a number of different types of printer.
- *FontPrint* – to convert Acorn outline fonts to PostScript fonts so that they can be downloaded to a PostScript printer.
- *!System*, *!Scrap* and *!Fonts* – directories containing resources used by other programs; these are also available for use by your own programs.

ReadMe files

Information on any changes that have been made to disc-based applications since this guide was published, will be included in a ReadMe file on the Applications disc. To read this file, load it into Edit, as described in *Loading files* overleaf.

Loading applications

Before you load an application, you first need to display the directory containing it. If it is a ROM application, display the Apps directory by clicking Select on the Apps icon on the icon bar.

If the application is on a floppy disc, insert the disc that contains it and click on the disc drive icon. If you have a hard disc, you can copy any of the disc-based applications onto it using the instructions in the chapter entitled *The desktop Filer* in the RISC OS 3 *User Guide*; this will make them even easier to load.

You can load an application in either of three ways:

- double-click on its icon in a directory display
- drag the icon downwards onto the icon bar
- double-click on one of the data files associated with an application.

The application may either start running immediately, creating any windows it needs, or it may set itself up on the icon bar. In the latter case, the application is running, in the sense that it has been loaded into memory and is executing, but it is in a passive state, waiting for you to do something, such as opening a new page, loading a file or clicking Menu on the icon.

Loading files

You load a file into an application in the same way: by double-clicking on it or by dragging it onto the appropriate icon on the icon bar.

By double-clicking

When you double-click on a file which is not an application, this is what happens:

1 The computer looks at the file type. If it recognises it, the computer decides which application the file should be loaded into, and loads it. If it is not a known type, an error message is displayed ('No run action specified for this file type'), and the file is not loaded.

This will happen if the computer has not 'seen' the application icon in the current work session. The computer knows where all the ROM applications are, but if it is not a ROM application you will have to put in the disc containing the application and then display the application icon on the screen. Thereafter, it will remember on which disc the application is stored if it needs it again, until you reset or switch off the computer.

2 If the application is not currently running, the computer will first load it and start it running, and then load the file into the application. If the computer cannot find the application, an error will be displayed.

3 The file is loaded by the application. The exact action now depends on the particular application, but typically a new window will be opened and the contents of the file displayed in it.

By dragging

A second way of loading a file is by pressing Select or Adjust on the file, and dragging until the mouse pointer is over an icon on the icon bar. If possible, the file will be loaded into the application you have dragged it to, normally in a new window.

You can also drag a file into an existing window of an application. Depending on the application, this will either open a new window for the file, insert the file into the existing contents of the window (replacing the old contents of the window), or insert the contents of the file at the insertion point.

When you load a file by dragging, it is up to the application whether to accept it. For example, the text editor Edit will allow you to load almost any type of file (though you will not be able to do much with some of them!), whereas Draw only permits a narrow range of file types. The application to which you drag a file can be different from the standard one for the type of file. An example of this is the sprite file type, which by default works with Paint (and therefore will be loaded into it on double-clicking), but which may also be dragged into Draw.

Saving files

Many applications use a standard method for saving files. There are two main variants to the method:

- Saving by dragging.
- Saving by specifying a pathname.

In both cases, saving is chosen from a sequence of menus that normally leads to a dialogue box (usually called **Save as**) containing an icon, an **OK** button and a box into which you can type the name you want to give the file. The filename that appears in the box will be the name of the file that was originally loaded (if one was), or a standard name for new files, such as `DrawFile`. You can change these names if you want to.

You can use either method for saving new files that have not been previously saved.

Saving by dragging

This is the easiest way to save a file – usually one which has not been saved before.

To save a file by dragging:

1. Open a directory display for the destination of the file (**where** you want to save it to).
2. Call up the application's **Save as** dialogue box.
3. Check the name under which the file will be saved. Change it if you need to.
4. Press Select or Adjust on the file icon and drag it to the destination directory display.

Saving by pathname

To save a file by pathname:

1. Call up the application's **Save as** dialogue box.
2. Check the name and the pathname of the file, and change it if you need to. The pathname must contain at least one directory name.
3. Press Return or click on the **OK** button. The file will be saved in the location indicated by the pathname.

Saving files which have been saved before

If you have saved a file before, you can still use either of the above methods, but there are easier ways:

- You can save a file under its existing name by opening the **Save as** dialogue box and just pressing Return or clicking **OK**. The existing file name and pathname will be used again.
- You can also just click on the **Save** option in the main menu; this will have the same effect as clicking on **OK** in the **Save as** dialogue box. However, it should be noted that in applications such as Edit and Draw where you can mark part of your document as a selection, clicking on **Save** in this way will save the whole file, not just the selection.

Saving on closing and quitting

When you close a window or quit an application, you may be asked if you want to **Save** any changes you have made. If you do, a **Save as** dialogue box will be displayed. Use it exactly as described above. If you don't want to save the changed file, click on **Discard**; this closes the file and your changes are lost.

Transferring data between applications

The techniques used for loading and saving are also used to transfer data between applications. When you want to do this, call up the first application's **Save as** dialogue box, and instead of dragging the file's icon to a directory display, drag it to an open window of the second application (or onto the application's icon on the icon bar). You can use this, for example, to

- load a Paint file into Draw
- load a text file into Draw

If the direct transfer fails (perhaps through lack of memory), some applications will attempt to use a temporary disc file for the transfer.

Not all applications can transfer data by this method, as data types are not always compatible. You can't, for example, drag a Draw file into Paint.

Quitting applications

If you want to stop using an application for a short while, but want to start using it again later, simply close any application windows that may be open. This leaves your screen uncluttered by unused windows. In most, but not all, applications, you will have to save the files you have been working on first. Another way is to 'iconise' the applications window using Pinboard (see the RISC OS 3 *User Guide* for details). With both these methods the application is still in your computer's memory – signified by the application's icon still being on the icon bar. To start using the application again, just click on the application's icon. Double-click on an iconised application's icon to start using it again.

If you want to finish using an application permanently, click Menu over the application's icon on the icon bar and choose the **Quit** option. This removes the icon and clears the application from the memory. To restart the application you must double-click on its icon in the appropriate directory display.

Documents and document icons

Some of the programs in the Applications Suite produce 'documents': files containing the text, drawing, image or tune you have edited or produced. In each case, the documents have a distinctive framed icon which allows you to relate it visually to the application (or 'editor') which produced it so you can tell at once what the filetype is. Here are the icons used by Edit and Draw.

Edit icon

Text file icon

Draw icon

Draw file icon

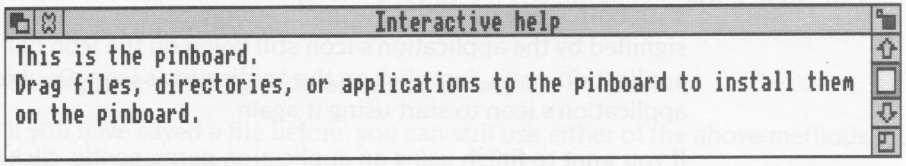
Getting help

This guide tells you how to use the applications supplied with RISC OS 3. As mentioned before, additional applications, which relate more closely to the operating system, are described in the companion RISC OS 3 *User Guide*.

An introduction to using RISC OS, and to your computer, is provided by the *Welcome Guide* supplied with the computer. The *Welcome Guide* also has a useful Glossary of computer jargon, and a Chapter on basic fault-finding.

The !Help application

The Help application is a program that displays information about other applications whilst they are working, and about the desktop generally. When you first use an application, you may find it useful to have Help present. To start Help, double-click on its icon in the directory display. A Help icon appears on the icon bar, and a window entitled **Interactive help** is displayed.


Interactive help
This is the pinboard.
Drag files, directories, or applications to the pinboard to install them on the pinboard.

This window will contain information about whatever the mouse pointer is over, though not all applications and parts of the desktop make information available. As you move the mouse to a different part of the desktop or application, the information changes.

You can remove the interactive help window by clicking on its Close icon. To redisplay the window, click Select on the Help icon on the icon bar. To close down Help altogether, choose **Quit** from the Help icon bar menu.

The Help option

On the main **Filer/Application** submenu there is a **Help** option. Click on this to obtain helpful information about an application. This option may be greyed out if the application does not have a help file.

Help on *Commands

If you want to find out about a particular *command, press the F12 function key to go into command line mode and then type *Help followed by the command you want help on and then press Return. To return to the desktop press Return on a blank line. The following example shows help for the keyword Help.

```
*Help Help

==> Help on keyword Help
*Help <subjects> attempts to give useful information on the selected topics.
Special keywords include:
Commands        List all the available utility commands
FileCommands    List all the filing system-specific commands
Modules         List the module titles
Syntax          Explain the syntax message format
*
```

Shared features in the Applications Suite

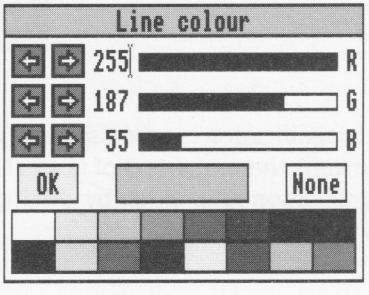
Several Applications Suite programs have features in common. Rather than explain these separately for each application, a description of the common features is given here. Remember, too, that the procedures for loading and saving files are similar in all the applications.

Keystroke symbols in menus

In many applications, frequently-used menu options can be chosen from the keyboard, with a set of keystroke equivalents, listed at the end of each chapter. These equivalents are also shown on the screen menus, where two symbols are used: ⇑ represents the Shift key, and ^ represents the Ctrl key.

The colour dialogue box

Draw and Paint (the latter in the Edit Palette facility) both make use of dialogue boxes for selecting colours for the picture being edited. Here is a typical colour dialogue box.



At any time, there is a range of sixteen standard colours. In addition, you can mix new colours. In screen modes which have fewer than 16 colours, some of the colours may be replaced by patterns.

The standard colours are shown in the patches at the bottom of the dialogue box. To choose a standard colour, click on the patch, and then click on **OK**.

To mix your own colour, you must set the intensities of red, green and blue in it. Each intensity is expressed as a number in the range 0 to 255. There are three ways of adjusting them:

- Drag a slider to the level you want.
- Click on the number next to a slider, and type in the new value.
- Click on the left and right arrows.

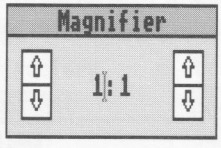
You can start off by clicking on a standard colour, then fine-tuning it to get the colour you want. As you mix a colour, it is shown in the colour mixing box next to the OK button. When you have selected the shade you want, click **OK**.

The colour displayed on the screen is the best approximation available in the current screen mode to the shade you select. The exact colour may be recorded by the application, so that it is displayed more accurately if you change to a screen mode which has more colours. 256-colour modes (such as mode 15) can often provide a good approximation.

Some colour dialogue boxes have a special entry used to specify that no colour is to be used. This takes the form of a box marked **None** to the right of the colour mixing box. To choose it, click on **None**, and then on **OK**.

The magnifier dialogue box (or Zoom)

The magnifier dialogue box (chosen from the Zoom option) is used for scaling the size at which a picture is displayed in Draw and Paint. An example magnifier is shown below.



The magnification is expressed as a ratio; for example 2:1 means twice normal size, 3:4 means three-quarters of normal size, and so on. You can change the magnification ratio either by clicking on the up and down arrows, or by typing in a new value at the caret.

Setting application options in Boot files

All of the programs in the Applications Suite can have their current state saved in a Desktop boot file. This state includes any options that may have been set and the size and position of the application windows on screen.

Subsequently, clicking on the Desktop boot file will automatically restore your screen to its previously saved state. You can also configure the Desktop boot file to be run automatically each time the computer is turned on.

You can easily overwrite your Desktop boot file accidentally. Always keep a backup. More information about using Boot files is contained in the chapter entitled *Desktop boot files* in the RISC OS 3 *User Guide*.

Part 1: Major applications

1 Edit

Edit is a text editor; you can use it to create and edit plain text, and to generate simple textual documents and command scripts.

Edit is also a BASIC program editor. It automatically converts BASIC programs into text format for editing, and then converts them back again when they are saved.

Edit is not a word processor: although it has many sophisticated features for handling text, word processors offer many additional facilities such as pagination and page layout control, style changes such as italic and underlined text, or continuous formatting.

Edit is controlled (like most RISC OS applications) from a set of menus. However, many menu choices are available directly from the keyboard, and once you are familiar with Edit, you may find that you prefer this method. These keystroke equivalents are listed at the end of this chapter.

Starting Edit

Edit is loaded in the same way as the other ROM applications.

1 Click on the Apps icon on the icon bar to display the Apps directory.

2 Double-click on the !Edit icon to install it on the icon bar.

3 Click on the Edit icon bar icon to start a new document.

Edit is a universal editor, which can edit and display most types of file:

- To edit an existing text file document, drag the file icon to the Edit icon on the bar, or double-click on it.
- To edit any other file type, drag the file icon to the Edit icon on the bar, or hold down the Shift key and double-click on it. BASIC files will be de-tokenised, and displayed as text.

Typing in text

When you first open a new Edit window, a red I-shaped bar – the **caret** – appears at the top left of the window. This is where text will appear when you start typing. You can open more Edit windows, but only one of them will have a caret in it: this is called the **current window**. It is also identified by the fact that parts of its border appear in cream rather than grey. You can type only in the current window.

You can easily move from one window to another, simply by moving the pointer over the window you wish to use and then clicking Select.

If you type in some text without pressing Return at all you will find that the window scrolls sideways (if your Edit window is smaller than the size of your screen). You can break your text into lines by pressing Return. Alternatively, click on the Toggle Size icon to extend the window to the full screen and avoid having to scroll sideways. There is another way of getting all your text into the window, using the **Format** option; this is described on page 15.

As you type, you will notice that Edit fills the current line and then carries on to the next line, often breaking words in the middle. Ignore this for the moment, as there is a menu option, **Wordwrap**, that will take care of it, and this will also be described later.

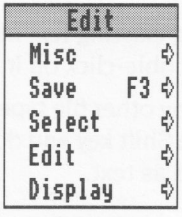
Inserting and deleting text

To insert or delete text, position the caret where you want to make the alteration by moving the pointer there and Clicking Select. You can insert text simply by typing. If you want to delete a character, position the caret immediately after it and press either Backspace or Delete; hold the key down and auto-repeat will come into effect, deleting more characters. If you want to delete characters to the right of the caret, press the Copy key.

There are quicker ways of deleting a lot of text – see *Manipulating blocks of text – the Select menu* on page 6.

Edit menus

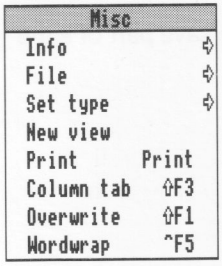
The top level menu contains the following options:



The Misc menu

This menu offers eight options:

Info tells you about Edit, including the version number of your copy of the program.



File gives information about the file you are working on, in particular

- whether it has been modified since you last saved it
- what type of file it is; a text file or a command file, for example (its icon, if it has one, is also shown)
- its name, including the full directory pathname
- its size, in number of characters
- the time and date it was last saved (or if you have not saved it yet, the time and date when it was first created).

New view opens a second window on the same text (you can in fact open several views, not just two; the total number of views open appears in the Title bar of each window, after the filename). This allows you to look at two parts of the same document, and makes many actions such as copying from one part of a document to another much easier. This feature is particularly useful with large documents. Remember that you are looking at one document, not at two separate copies of it: to illustrate this, try looking at the **same** part of a document in two views (**not** the way you will normally use **New view**!); enter some changes in the first view and you will see the same changes appearing in the second view.

Set type allows you to set the type of the file you are currently editing. For example, a text file will have the file type `Text`, and a BASIC file the file type `BASIC`.

Print sends the document to the currently activated printer driver. See the section entitled *Printing an Edit file* on page 17 for more information about how to print. The Printers application must be running to enable you to print.

Column tabs switches on a different type of tab insertion: this is explained in the section entitled *Laying out tables: the Tab key* on page 17. When this option is on, it is ticked in the Misc menu and 'ColTab' appears in the Title bar.

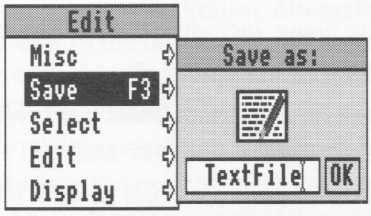
Overwrite, when switched on, means that each character you type replaces the character at the cursor, instead of pushing the cursor aside and inserting the new character. When this option is on, it is ticked in the Misc menu and 'Overwrite' appears in the Title bar.

Wordwrap prevents words being split over line-ends as you type. When this option is on, it is ticked in the Misc menu and 'Wordwrap' appears in the Title bar. Words are wrapped when they exceed the number of characters given in the **Format text** box.

Do not confuse this option with **Window wrap**, selected from the Display submenu: Wordwrap, unlike Window wrap, inserts a newline character (which is there although you cannot see it on the screen) when the cursor moves to a new line.

Saving text: the Save menu

The Save menu allows you to save a complete file; you can also save part of a file using the Select menu, described below.



The procedure for saving is common to many applications, including Draw and Paint, and is described in full in the chapter entitled *Introducing the Applications Suite* on page ix.

In order to save a file in the easiest way, you need to have on the screen the directory display for the directory where you want to save the file. Click Menu over the Edit window, and move to the **Save** submenu. A dialogue box appears, containing an icon, the current filename, and an **OK** button. If the file has not been saved before, Edit offers you a default filename of 'TextFile'. If you want a different name, use Backspace or Delete (or press Ctrl-U) to delete TextFile, then type in the name you want. Place the pointer on the icon in the box and drag the icon into the directory display where you want to keep the new file. An icon for the file then appears in the directory window.

This action assigns a full pathname to the file, as you will see from the Title bar of the Edit window. When you have made some changes to the text and want to save the file a second time, use the Save option again, but this time, provided you want to use the same filename, you can save the file by clicking the **OK** box. Saving the file with the same name overwrites your old file with the new information.

You can also save **part** of the text, typically for printing or transferring to another application, using the **Select/Save** option, described in the next section.

Manipulating blocks of text – the Select menu

You can select blocks of text, then manipulate them in various different ways.

The simplest way to select a block is to position the caret where you want the block to start, click and hold down the Select button, then drag the pointer to the end of the block and release the button. The selected block of text is highlighted.

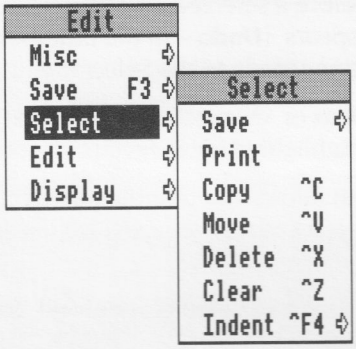
If necessary, you can then use Adjust to 'adjust' the ends of the block. Position the pointer exactly where you want the block to start or finish, click Adjust and the block lengthens or shrinks accordingly. This is particularly useful when you want to

select a block that extends beyond the part of the text you can see in the window. Select a few words or lines at the start of the block, scroll until you can see the point where you want the block to end, place the cursor there and click Adjust.

Here are some other ways of selecting blocks of text:

To	Do this
select a single word	double-click Select
select a single line	triple-click Select
extend block to whole word	double-click Adjust
extend block to include current line	triple-click Adjust

Once selected, text can then be saved, copied, moved, deleted, de-selected (cleared) or indented by choosing options from the Select menu:



To **Save** a selected block, move to **Save** from the Select menu, and follow the standard saving procedure. Use this option to copy a selection into another Edit window; open a new window and drag the icon into it. The copied block will appear after the current caret position in the destination window. The caret is also moved to the end of the copied text.

To **Print** a selected block of text, click on the Print option. See the chapter called *Printing* in the RISC OS 3 *User Guide* for information on printing.

To make a **Copy** of a selected block of text, select (highlight) your block of text and then position the caret where you want the copy inserted, then call up the **Select** submenu and click on **Copy**. The original block remains selected. Keep clicking on **Copy** to make as many copies as you want.

If the caret is already at the position where you want the copied block to appear, press and hold Ctrl while making the selection in the usual way. Copy the block by pressing Ctrl-C. This way you can make a selection without moving the caret.

If you copy to a position inside a selected block, both the original and the new copy remain selected. If you then make multiple copies you will get double the number you indicate. This may happen accidentally if you position the caret immediately to the right of a selected block ending in a newline character: because the newline character does not appear on the screen it is not highlighted, but is still part of the selected block. To undo an action, choose **Undo** from the Edit menu.

To **Move** a selected block of text, select your block of text and place the caret where you want the text moved to, then click on **Move**.

If the caret is already where you want the block to end up, press and hold Ctrl while making the selection in the usual way. Then still holding Ctrl, press V, and the block will be moved to the caret position. This way you can make a selection without moving the caret.

To **Delete** a selected block of text, click on **Delete**. The marked block then disappears. (**Undo** – in the Edit menu – allows you to reverse any changes or deletions made in the Select menu).

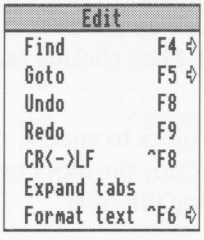
To **Clear** or 'deselect' a block of text you have previously selected, click on **Clear**. The highlighted block reverts to normal and the block is no longer selected.

Indent allows you to indent a selected block of text. The indent is defined in character spaces. You can also use Indent to add a text prefix to the beginning of each line of a block.

To indent a selected block of text, call up the Indent submenu, then type in a number.

- A positive number gives you an indent of the specified width.
- A negative number, –5, for example, deletes the specified number of spaces or characters from the beginning of the block line; use this to cancel an indent.
- You can also type in text: IGNORE, or NB, for example. This will then appear at the beginning of every line in the selected block. You can remove this text by indenting with a suitable negative number.

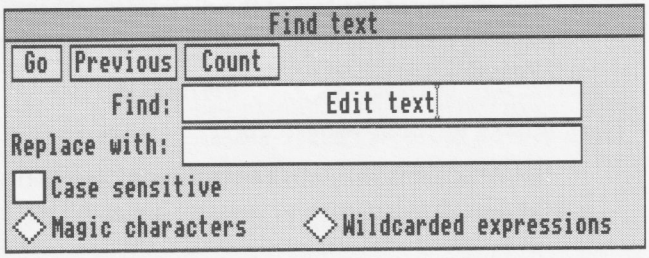
The Edit menu



The first option in the Edit menu is **Find**. At its simplest, this allows you to locate any character(s) in your file. You can also use it to replace text with other text. To make sure that the search is complete, always position the caret at the start of the file before giving the Find command. In the following description, the text being searched for is referred to as a 'string'; it may consist of any sequence of letters, numbers, spaces or other characters.

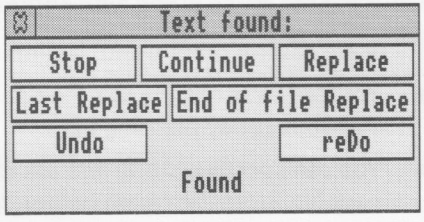
Searching for a string of characters

To use Find without doing anything with the found string, choose **Find** in the Edit submenu: the **Find text** dialogue box appears, with the caret in the **Find** box. Type in the string you want to locate and press Return. The caret then moves to the **Replace with** box.



Since on this occasion you do not want to replace the found strings with anything, either click on **Go**, press Return or press **F1**.

Edit finds the first occurrence after the caret of the word in your file, then displays the **Text found** dialogue box, indicating the operations available.



To look for the next occurrence of your string, click on **Continue**. To abandon the search, click on **Stop**, or press Return or Escape.

Replacing a string of characters with a new string

To use Find for replacing a string with a new string, go to the **Find text** dialogue box as before, but this time, insert the new string into the **Replace with** box. Then press Return, and the **Text found** dialogue box appears.

Click on **Replace** to substitute the new string for the old string; if you do not want to change this particular occurrence of the old string, click on **Continue** and Edit moves on to the next one.

If you click **Last Replace**, Edit replaces the currently found instance of the string, but does not search for further occurrences.

If you click on **End of file Replace**, Edit finds and replaces all occurrences of the string from the present one forward to the end of the file, without stopping at each one for instructions.

Clicking on **Undo** takes you back to the last string replaced and returns it to the original version; click **reDo** to change it back again.

The display at the top of the dialogue box keeps you informed of the state of the search; if Edit cannot find the word you have specified, it displays the message **Not Found**.

Using keyboard shortcuts

Besides using the Select button, you can control all these options from the keyboard; the particular keys are indicated by the capital letters in the dialogue box. Press S and the search **S**tops, press C and it **C**ontinues, D and it will re**D**o, and so on. Pressing Escape or Return also stops the search and removes the **Text found** window.

Other useful facilities

Note that you can use Find to delete strings in a text, by entering nothing in the **Replace with** box, and clicking on **Replace** in the **Text found** dialogue box, thus replacing the found string with nothing: deleting it, in effect.

There are several other useful facilities in the **Find text** dialogue box:

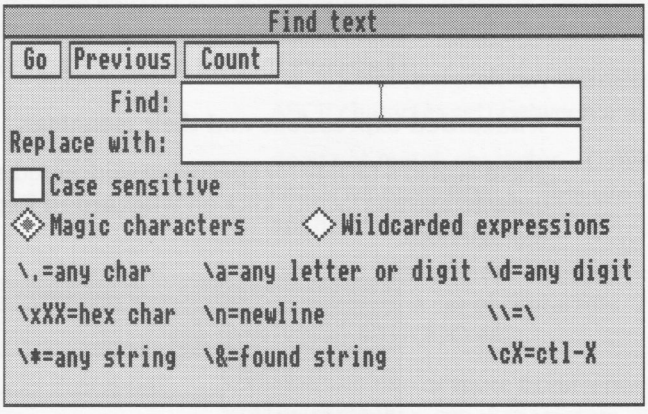
- You can carry out the last Find and Replace operation again, by clicking **Previous** (or by pressing F2).
- You can specify a string and ask Edit to count the number of times it occurs in your file (from the caret position to the end of the file) by clicking on **Count** (or by pressing F3).
- By default, Find makes no distinction between upper and lower case characters – Hello will match to both HELLO and hello, or for that matter, hElLo – you can specifically ask it to match case by clicking next to **Case sensitive** (or by pressing F4). Hello will then match only Hello. Case sensitivity remains selected until you deselect it by clicking again.

Magic characters and their meanings

You can also use the Find facility to search for classes of characters. To activate this feature, click on **Magic characters** (or press F5) in the **Find** dialogue box.

Magic characters are indicated by a \ character, as shown in the lower half of the dialogue box, which shows you the available characters.

Type these characters in directly as shown in the window.



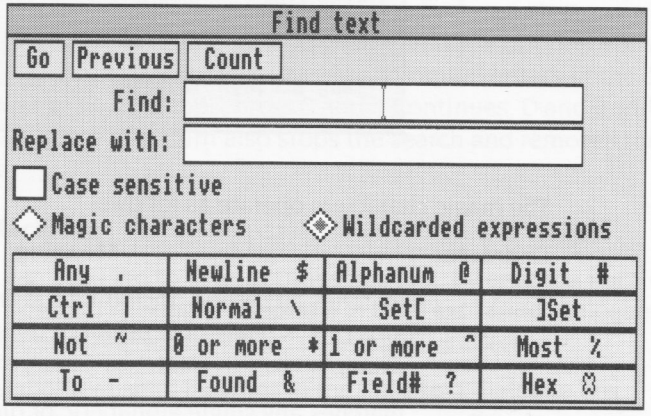
The magic characters operate as follows:

Character	Meaning
`\*`	matches any string (including a string consisting of no characters at all). This is really only useful in the middle of a search string. For example, `jo\*n` matches `jon`, `john`, and `johaan`.
`\a`	matches any single alphabetic or digit character. So `t\ap` matches `tip`, `tap`, and `top`, but not `trap`.
`\d`	matches any digit (0 to 9)
`\.`	matches any character at all, including spaces and non-alphabetic characters.
`\n`	matches the newline character (remember that to the computer, this is a character just like any other).
`\cX`	matches Ctrl-X, where X is any character.
`\&`	is used in the **Replace with** box to represent the **found string**: the string matched in the search. This is particularly useful when you have used magic characters in the Find string. For example, if you have searched for `t\ap`, and you want to add an s to the end of all the strings found, `\&s` in the **Replace with** box will replace `tip`, `tap` and `top` by `tips`, `taps` and `tops`.
`\\`	enables you to search for a string actually containing the backslash character `\` while using magic characters. To search for the strings `cat\a` or `cot\a`, enter `c\at\\a`.

Character	Meaning
\xXX	matches characters by their ASCII number, expressed in hexadecimal. Thus \x61 matches lower-case a. This is principally useful for finding characters that are not in the normal printable range.

Wildcarded expressions and their meanings

There is also a facility for specifying wildcarded expressions in search strings. In order to use this facility, click on **Wildcarded Expressions** (or press F6) in the **Find** dialogue box.



Click on the wildcard character you wish to enter and it is copied into the text box.

The wildcard characters operate as follows:

Character	Icon name	Meaning
.	Any	matches any single character
$	Newline	matches linefeeds
@	Alphanum	matches any alphanumeric character. A to Z, a to z, 0 to 9, and _
#	Digit	matches 0 to 9
|	Ctrl	matches any control character. For example, to search for Ctrl-z, type in | z
\	Normal	matches any character following it even if it is a special character. # would be searched for as \#.

Character	Icon name	Meaning
[ ]	Set	matches any one of the characters between the brackets. This is always case sensitive.
-	To	`[a-z]` would match any character (in the ASCII character set) between a and z.
~	Not	does not match character. `~C` matches any character apart from C. This can also be applied to sets.
*	0 or more	matches zero or more occurrences of a character or a set of characters. `T*O` matches T, TO,TOO, TOOO etc.
^	1 or more	matches one or more occurrences of a character or a set of characters. `T^O` matches TO, TOO, TOOO etc.
%	Most	`%c` is the same as `^c`, except when used as the final element of a search string. In this case the longest sequence of matching characters is found.
&	Found	refers to the whole of the 'Find' text. It is used in the **Replace with** box to represent the 'found string': the string matched in the search. This is particularly useful when you have used wildcard characters in the Find string. For example, if you have searched for t.p, and you want to add an s to the end of all the strings found, `&s` in the **Replace with** box will replace tip, tap and top by tips, taps and tops.
?	Field	If a string was found that matched the search pattern, then `?n` refers to the part of the found string which matched the nth ambiguous part of the search pattern, where n is a digit from 0 to 9. Ambiguous parts are those which could not be exactly specified in the search string; e.g. in the search string `%#fred*$` there are two ambiguous parts, `%#` and `*$`, which are `?0` and `?1` respectively. Ambiguous parts are numbered from left to right. (Only to be used in the **Replace with** string).

Character	Icon name	Meaning
⍰	Hex	⍰nn matches the character whose ASCII number is nn, where nn is a two-digit hex number. `X61` matches lower-case a. This is principally useful for finding characters that are not in the normal printable range.

The full power of the wildcard facility can be illustrated by a few examples.

- To count how many lower case letters appear in a piece of text:

  ```
  Find: [a-z]
  ```

  and click on **Count**.

- To count how many words are in a piece of text:

  ```
  Find: %@
  ```

  and Click on **Count**.

- To surround all words in a piece of text by brackets:

  ```
  Find: %@
  Replace with: (&)
  ```

  and click on **GO**, then on **End of File Replace** in the Found dialogue box

- To change all occurrences of strings like `#include "h.foo"` into `#include "foo.h"`:

  ```
  Find: \#include "h\.%@"
  Replace with: #include "?0.h"
  ```

  and click on **GO**, then on **End of File Replace** in the Found dialogue box

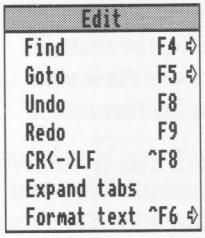
- To remove all ASCII characters, other than those between space and ~, and the newline character, from a file:

  ```
  Find: ~[ -\~$]
  Replace with:
  ```

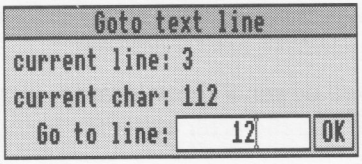
  and click on **GO**, then on **End of File Replace** in the Found dialogue box (ie find all characters outside the set from the space character to the ~ character, and newline, and replace them with nothing). In fact this could be written without the `\`, since ~ would not make sense in this context if it had its special meaning of **Not**, ie:

  ```
  Find:  ~[ --$]
  ```

Other options on the Edit menu:



To send the caret to a specific line of text, use the **Goto** option. Call up the **Goto** submenu and Edit displays a dialogue box:



Type in the line number you want to move to, then click on **OK**. The dialogue box disappears, and the screen displays the caret, positioned at the beginning of the line you have just specified. Note that this option understands 'line' to mean the string of characters between two presses of Return. If you have not formatted your text, a line in this sense may run over more than one display line.

Undo allows you to step backwards through the most recent changes you have made to the text. The number of changes you can reverse in this way varies according to the operations involved.

Redo allows you to remake the changes you reversed with **Undo**.

CR↔LF allows you to convert the linefeeds in your text to carriage returns (and carriage returns to linefeeds).

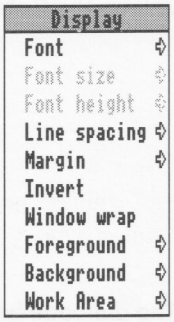
If you convert from linefeeds to carriage returns, the file will be converted to one continuous line, with carriage return characters inserted where linefeeds have been removed. Though it is possible to edit a file in this state, you may find that updating the screen takes a long time. This facility is useful when importing text from other text editors, which may use carriage returns where Edit uses line feeds.

Expand Tabs converts each tab character into eight spaces, since some printers can interpret spaces more easily than the tab character.

Format text allows you to reformat a paragraph of text – from the caret to the next blank line or line starting with a space – so that the lines fill the screen and break correctly at the ends of words. It is useful for tidying up text after editing. Position the caret at the beginning of the paragraph, choose **Format text** in the Edit menu and enter the number of characters per line you want your text to have in the **Format width** dialogue box. Then move the pointer back over the Edit menu and click on **Format text** to format the paragraph.

The setting in the **Format width** dialogue box also controls the length of lines when you are entering text with **Wordwrap** switched on.

The Display menu



Display allows you to change the way your text looks on the screen: you can experiment with fonts, colours, line spacing and margins. However, the features you select do not form part of the text when you save it. If you choose **New view** in the Misc menu to display two windows on the same file, the Display features in both windows can be different.

Font offers you a choice of fonts (typefaces). **System font** is the default font, and has a fixed character width. For further information on fonts, see the RISC OS 3 *User Guide*.

You can use **Font size** to set the point size (height and width) of the characters displayed on the screen. Either select one of the sizes indicated, or position the pointer on the bottom (blank) line of the menu; you can then type in another size.

Font height allows you to set the height of the characters displayed on the screen, leaving their width unchanged.

Line spacing increases or decreases the space between lines. It is measured in pixels, the smallest unit the screen uses in the current mode. The selected font size assigns a suitable line spacing; this option is therefore used only to increase (or if you type a negative number, to decrease) the given spacing.

Margin sets a left margin, again in pixels.

Invert swaps foreground and background colours, so that black text on white becomes white text on black, and so on.

By default, Edit assumes a text width of 76 characters, but the default window is not as wide as the full screen. You can of course change the number of characters per line (by choosing **Format text** in the Edit menu) or enlarge the window to the full screen by clicking on the Toggle Size icon. Alternatively, clicking **Window wrap** makes your text fit the size of the window. When Window wrap is on, you can change the window to any size, and the width of the text will change accordingly. You can revert to the default by selecting **Window wrap** again.

Foreground allows you to display the text in any one of the sixteen colours, by clicking on the selected colour from the palette displayed.

Background allows you to set the window's background colour, as above.

Work area allows you to set the extent of your Edit windows so that you can have windows which are wider than the current screen mode. Normally Edit restricts the maximum horizontal extent of a window to the size of the screen in the current mode, but you can specify a longer line length in terms of System font characters in the **Work area** submenu (the size of System font characters is used even if the current font used is a fancy font). This is particularly useful if you have a text file

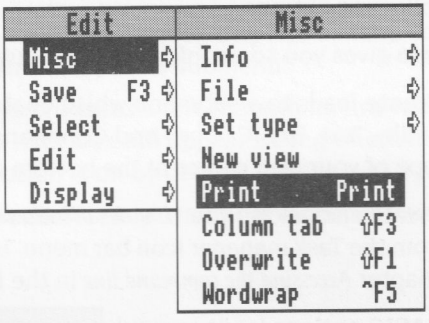
which, for example, is 80 or 132 characters wide and you are viewing it in mode 12. The maximum size of window width which can be specified in this manner is 192 System Font characters.

This option is not available when the **Window wrap** option is on.

Printing an Edit file

There are several ways of printing an Edit file; however, to use them, you first need to load the Printers application. For how to do this, refer to the chapter *Printing* in the RISC OS 3 *User Guide*.

If the file you want to print is already loaded into Edit you can simply click on the **Print** option on the **Misc** menu. Another way is to call up the **Save as** dialogue box and drag the icon onto the printer driver icon on the icon bar. This will print the current version of the file, whether or not it has been saved.



If the file is not loaded into Edit, you can simply drag the file's icon from its directory display onto the printer driver icon. You can also do this if the file is loaded, but if you have made any changes to it since you last saved it, they will not appear in the printed copy; only what has been saved will be printed by this method. Finally, you can also print by pressing the Print key on the keyboard.

Laying out tables: the Tab key

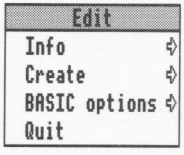
To set out a table, type in the first line – the column headings, for example – as you want it to appear, using spaces to separate the text in the columns. Then press Return. On the next line, pressing Tab will make the cursor jump to the position underneath the start of the next word in the line above.

If you want your table to have columns regularly spaced eight characters apart, click on **Column tabs** in the Misc submenu. The word ColTab will appear in the window's Title bar to remind you that you have done this. Pressing Tab will then cause the cursor to jump to the next tab position.

Reading in text from another file

If you want to add all the text from another file into the file you are currently editing, position the caret at the point where the inserted text is to appear. Call up the directory display for the incoming file, and drag its icon into the text window. The entire contents of the source file is then copied into the destination file at the caret position. The caret will then appear at the end of the text you have inserted.

The Edit icon bar menu



Pressing Menu on the Edit icon on the icon bar produces a menu with the following options:

Info gives you some information about the version of Edit you are using.

Create leads to a submenu which enables you to open windows for specific types of file: Text, BASIC, Obey and Command files. Alternatively you can type in a file type of your own choice at the bottom of the menu.

Create also allows you to start a Task window. Task windows can also be started from the Task manager icon bar menu. How to use Task windows is described in the chapter *Accessing the command line* in the RISC OS 3 *User Guide*.

BASIC options leads to a submenu with which you can choose how to display BASIC programs. **Strip line numbers** causes line numbers to be stripped out when loading BASIC files. **Line number increment** sets the number increment between successive lines in the program.

Quit stops Edit and removes it from the computer's memory, first presenting you with a dialogue box for confirmation if there are any current files you have not saved.

Using Edit to write and edit BASIC programs

Edit also allows you to write BASIC programs. It converts the Text files produced in Edit to tokenised BASIC files.

Writing a new program

To write a new program, click Menu over the Edit icon on the icon bar and from the **Create** menu choose **BASIC**. You can now type your program directly into an Edit window. There is no need to include line numbers, as Edit will insert them for you when you save the file. Press Return at the end of the last line of the program.

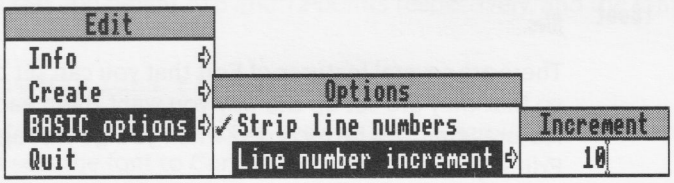
Editing an existing program

To use Edit for working on an existing BASIC program, simply drag the program's icon from its directory onto the Edit icon on the icon bar.

Icon bar menu

Pressing Menu on the Edit icon bar icon displays a menu containing the Edit options. Move to the **BASIC options** submenu:

- **Strip line numbers** produces a text file with no line numbers. If a reference to a line is found, an error box will appear asking whether you want to leave the number in. This option is on by default.
- **Line number increment** sets the number increment between successive lines in the program.



Converting to a tokenised file

Converting a text file to a tokenised file is usually quite straightforward. If there are no line numbers, Edit will start at 10 and increment by 10. If line numbers are supplied, these are used as a basis for any lines without line numbers.

Warnings

If there are line numbers, Edit will **not** sort them into ascending sequence and the resulting BASIC program may behave very strangely.

If your code is incomplete, Edit will warn you about the following problems:

- Line number reference too large.
- Mismatched quotes.
- Mismatched brackets.

In all cases Edit will also quote the offending line number. After you have clicked on **OK**, the tokenising continues.

Attempts to tokenise a crunched program (e.g. one with the spaces removed) will generally result in a non-functioning program.

Printing a BASIC program

If you have Edit running, you can print a BASIC program on paper by dragging its icon onto a printer driver icon. Edit will perform the conversion to allow the program to be printed.

Saving Edit features in a Desktop boot file

You may wish to change some aspects of the way new Edit windows appear. For example, a new window normally opens using black text on a white background, but you may prefer to have blue text on a red background ready to use each time you start Edit.

!Boot

You can set features of this type by setting up Edit just as you wish to use it, then save these features by creating a Desktop boot file. Instructions on how to create a Desktop boot file are given in the RISC OS 3 *User Guide* in the chapter *Desktop boot files*.

There are several features of Edit that you can set before saving a Desktop boot file, so that they are set up the way you want them each time you switch on. The Edit features that will be recorded when you go through this process are known as Edit$Options.

Saving display features

Any Edit display features that you set before creating your boot file will be saved, so that the computer not only loads Edit, but sets the display features you have chosen.

If you wish to set the Edit display features each time you start your computer, **without running Edit itself**, follow these steps:

1 Create a Desktop boot file following the instructions above and in the RISC OS 3 *User Guide*.

2 Load the resulting !Boot file into Edit by dragging it onto the Edit icon (not by double-clicking: this will run the !Boot file).

3 Search for the line which runs Edit: this will read something like

```
Run Resources:$.Apps.!Edit
```

4 Delete that line and resave the !Boot file.

(Leave the line starting

```
Set Edit$Options
```

unchanged.)

Customising the Desktop boot file

If you change some of Edit's display features and then create a Desktop boot file using the Task manager, you can load the file into Edit to examine it. You will find a line reading

```
Set Edit$Options ...
```

where the string of letters and numbers corresponds to the display features you have selected. (If you have not changed any display features, no `Edit$Options` line will appear in your boot file.)

Here are two examples:

```
Set Edit$Options F13 B0 W8 H12 NTrinity.Medium
```

This sets the text colour to olive green (colour 13) on a white background (colour 0), the font width and height to 8 and 12 points respectively, and the font to Trinity Medium.

```
Set Edit$Options F8 D NCorpus.Medium
```

This sets the text colour to dark blue, leaving the background white, switches word wrap on, and sets the font to Corpus Medium.

If a font name is specified it must appear last in the list of Edit$Options.

The table below identifies the display features that will be recorded when you do this, and provides a reference for those who may wish to create their own boot file without using the Desktop boot facility, or who may wish to edit a boot file after creating it.

Letter	Feature specified	Default
F	Foreground (text) colour	7 (black)
B	Background	0 (white)
W	Font width	10
H	Font height	10

Letter	Feature specified	Default
M	Left margin in pixels	0
L	Extra spacing between lines (a negative number will produce closer lines)	0
R	Window wrap	off
D	Wordwrap on new windows	off
O	Overwrite in new windows	off
T	Column tab	off
U	Size of undo buffer in bytes	5000
A	Format width	77
N	Font name	System font

Keystroke equivalents

On occasions, it can be quicker when you are working in Edit to use the keyboard instead of the mouse, especially once you are familiar with the program.

When editing

Keystroke	Effect
←, →, ↑, ↓	Move caret one character left, right, up or down.
Shift-←, Shift-→	Move caret one word left or right.
Shift-↑, Shift-↓	Move caret one page up or down.
Ctrl-↑	Move caret to start of file.
Ctrl-↓	Move caret to end of file.
Ctrl-←, Ctrl-→	Move caret to start or end of line.
Shift Ctrl-↑, Shift Ctrl-↓	Scroll file without moving caret.
Ctrl Shift - →	Scroll document up by one line
Ctrl Shift - ←	Scroll document down by one line
Copy	Delete character to right of caret.
Shift-Copy	Delete word at current caret position.
Ctrl-Copy	Delete line at caret.
Home	Place caret at top of document.
Insert	Insert space to right of caret.
Page Up/Page Down	Scroll up or down one window.
Shift-Page Up/Page Dn	Move caret up or down one line without scrolling.
Ctrl-Page Up/Page Dn	Move caret and scroll up or down one line.
Shift-F3	Toggle column tabs on or off.
Shift-F1	Toggle overwrite mode on or off.

Keystroke	Effect
Ctrl-F5	Toggle word wrap on or off.
Ctrl-F7	Make where the caret is the current selection and move the caret to where the selection was (i.e. toggle caret and selection).

Keystroke equivalents in the Select menu

Keystroke	Effect
Ctrl-Z	Clear selection.
Ctrl-X	Delete selection.
Ctrl-C	Copy selection to caret.
Ctrl-V	Move selection to caret.

Keystroke equivalents in the Edit menu

Keystroke	Effect
F4	Display **Find** dialogue box.
Ctrl-F4	Indent selected block.
F5	Display **Goto** dialogue box.
F6	If no block is selected, select the single character after the caret. If a block is selected, and the caret is outside it, extend the selection up to the caret. If a block is selected and the caret is inside it, cut the block from the caret position to the nearest end of the block.
Shift-F6	Clear the current selection.
F7	Copy the selected block to the current caret position.
Shift-F7	Move the current selection to the caret position.
F8	Undo last action.
F9	Redo last action.
Ctrl-F6	Format text block.
Ctrl-F8	Toggle between CR and LF versions of the file.
Ctrl-Shift-F1	Expand tabs.
Ctrl-F2	Close the Edit window.

Keystroke equivalents in the Find menu

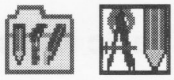
Note: these keystroke definitions only come into play once the **Find** dialogue box has been displayed (e.g. by typing F4).

Keystroke	Effect
↑, ↓	Move caret between the find and replace text in the Find box.
F1	This starts the search and displays the **Text found** dialogue box if the text string is found.
F2	Use previous find and replace strings.
F3	Count occurrences of find string.
F4	Toggle case sensitive switch.
F5	Toggle magic characters switch.
F6	Toggle wildcard expressions switch.

Keystroke File options

Keystroke	Effect
F2	Open a dialogue box enabling you to load an existing Edit file into a new window.
Shift-F2	Open a dialogue box enabling you to insert an existing Edit file at the caret position.
F3	Save the file in the current window. This is a shortcut to the normal **Save as** dialogue box.
Shift-drag	If Shift is held down and a file icon is dragged onto an existing Edit window, the name of the file is inserted at the caret position.
Shift-double-click	Shift double-clicking on a file icon loads any text or non-text file into Edit.

2 Draw



Draw is a powerful and sophisticated drawing package; you can use it to draw and edit diagrams and pictures made up from various kinds of graphical objects.

Learning to use Draw

You will probably find that the easiest way of learning Draw is to read through *Basic ideas* (on the next page), where you will find an introduction to how to create and edit the different kinds of object which Draw uses. Then work through the *Draw tutorial* which follows, before reading the more detailed sections.

Starting Draw

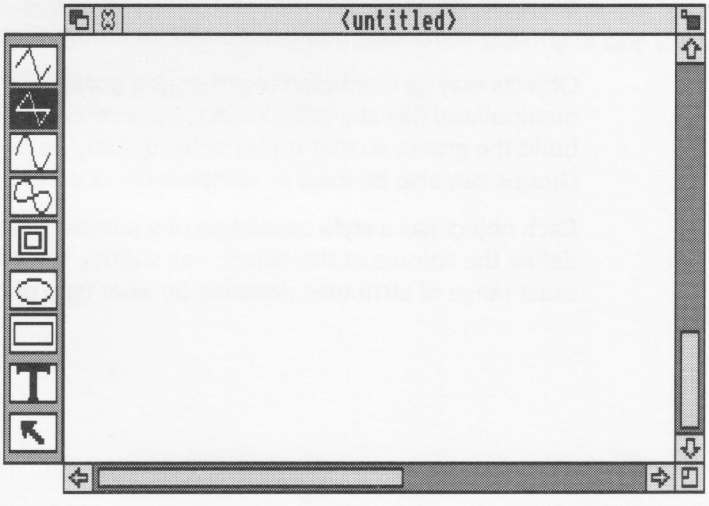
Draw is loaded in the same way as the other ROM applications.

1 Click on the Apps icon on the icon bar to display the Apps directory.

2 Double-click on the !Draw icon, to install it on the icon bar.

3 Start a new drawing by clicking on the Draw icon bar icon.

Alternatively, edit an existing drawing by dragging its file icon to the Draw icon on the bar, or by double-clicking on it.



Basic ideas

The Draw window

The Draw window looks similar to other application windows when you first load it, except that down its lefthand side there is a strip of icons called the Toolbox. The Toolbox allows you to choose what sort of object you wish to draw, or to select objects in order to alter them without having to use the menus.

Objects

A Draw diagram is built up from **objects** of a number of different types. Draw stores information about each object used to construct the diagram. This means you can subsequently change individual objects – for example, by moving them, scaling them to a different size, or changing their colour – without affecting the other objects.

The basic object types are:

- **Paths,** consisting of a sequence of line segments. Each of the line segments may be straight or curved. A path may be closed to form a polygon or curved object, or left open. The path is the basic element of a drawing.
- **Rectangles and ellipses**: these are, in fact, also paths, which means that they may be edited in a very flexible way.
- **Lines of text**, in a range of fonts and sizes.
- **Sprites**: graphic shapes made up of an array of coloured pixels. For an introduction to sprites, see the next chapter about Paint. Sprite objects can only be created by loading sprite files.
- **Text areas**, consisting of several lines of text. Text areas can be used for simple desktop publishing, and for annotating drawings.

Objects may be combined together as a **group**. For most purposes, a group can be manipulated like any other object. Draw records the objects that were used to build the group, so that it may subsequently be 'ungrouped' into its constituents. Groups can also be used as components of other groups.

Each object has a **style** consisting of a number of attributes. Attributes are used to define the colours of the object, line widths, text fonts and sizes, and so on. The exact range of attributes depends on what type of object it is.

Draw 'modes'

You can use Draw in three operating modes:

- **Enter mode** is used to create new objects.
- **Select mode** is used to change object attributes, and to move and alter objects on the screen.
- **Path edit mode** is a special mode used to change parts of paths.

Enter mode and **Select mode** are chosen from the main Draw menu or from the toolbox (described below). **Path edit mode** is entered via Enter mode or from the Select menu.

The mouse pointer changes according to which mode you are using: in Enter mode it is shown as a star, and in Select and Path edit mode as an arrow.

Shortcuts

To make it easier to construct a diagram, Draw has a number of tools and shortcuts. Firstly, there is the Toolbox attached to the lefthand edge of each Draw window. You can use this to indicate the sort of action you want to carry out, without having to use the menus.

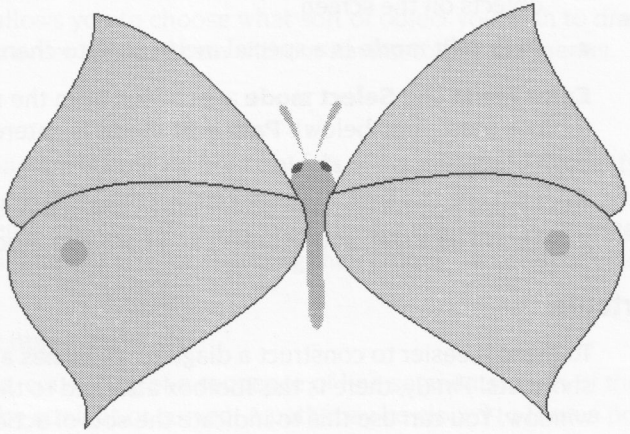
To help you align objects in a diagram, a grid may be displayed. Various different sizes and shapes of grid are available.

When you are familiar with Draw through its menus, you may find that you prefer to use the keystrokes that duplicate the effect of the more frequent Draw actions. These are listed at the end of this chapter, and also appear alongside the corresponding menu entries on the screen.

Finally, you can display more than one view of a diagram; these can have different grid and zoom factor settings. Changes made to the drawing in one view affect the other view as well.

Draw tutorial

This tutorial section provides you with an introduction to Draw through the creation of a simple picture. If necessary, remind yourself of general RISC OS ideas and terms before you start, by going back to your *Welcome Guide* or *User Guide*.



Brimstone butterfly

In the tutorial, you will be taken step-by-step through the process of creating this picture of the Brimstone Butterfly.

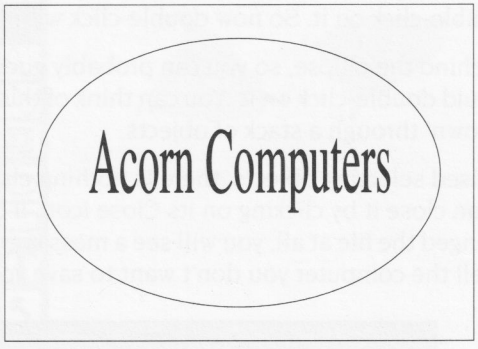
Selecting Draw objects

Before you start on the butterfly, you should spend a short time practising how to **select objects**. This is important because before you can do anything to a Draw object – move it, for instance, or change its colour – you must select it. A Draw picture will typically contain lots of objects overlapping each other, or you may have one object completely behind another. As you work on a drawing you will inevitably find quite often that the object you want to change is not selected, if only because you had to interrupt your work and reload the file.

In the App 2 disc or directory you will find a **Tutorials** directory. In this are the files used in the tutorials in this guide.

Before you start work on the butterfly, here is a quick lesson on selecting stacked objects.

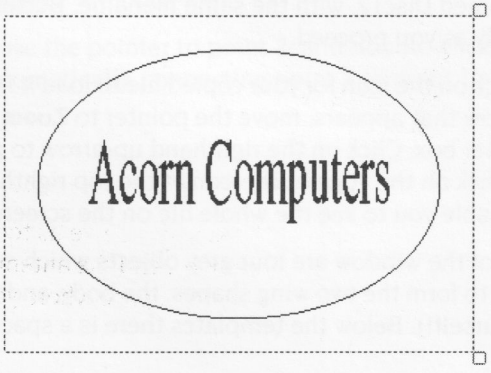
Go to the `Tutorials` directory and double-click on the file called `Plaque`. Once this file is loaded it looks like this:



This drawing consists of three objects: the rectangle, the ellipse and the text 'Acorn Computers'. They are stacked from front to back, in that order. (Incidentally, as you create a series of objects, a newer one will always be in front of an older one, though you can change their order later if you wish.)

To select an object, you first need to choose the correct tool (shown on the left): this is the arrow at the bottom of the toolbox. Click on this and it will be highlighted.

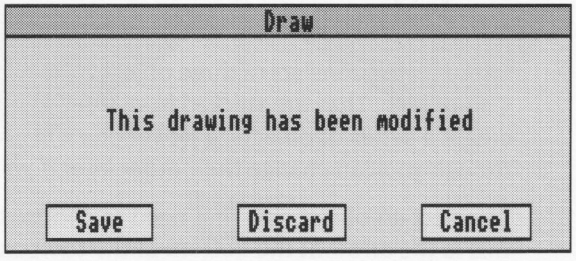
When part of an object sticks out beyond others, you have no problem: as long as you choose that part of the object to click on, it will be selected. When an object is in front of others, again, you have no problem: click anywhere within it to select it. You can do this with the rectangle: click on it and a dotted box will appear around it, indicating that it is selected:



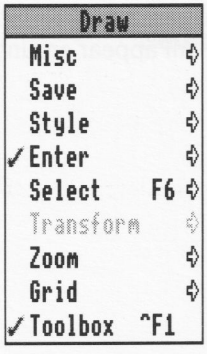
However, suppose you actually want to select the ellipse, perhaps in order to delete it. No parts of the ellipse extend beyond the edges of the rectangle. A click within the ellipse will just leave the rectangle selected, because the rectangle is in front of the ellipse. To select an object that is completely behind another object, you must double-click on it. So now double-click within the ellipse.

The text is behind the ellipse, so you can probably guess by now that to select the text, you should double-click on it. You can think of this as a series of double clicks 'tunnelling down' through a stack of objects.

Having practised selecting objects, there is nothing else you need to do with this file, so you can close it by clicking on its Close icon. If during your experimenting, you have changed the file at all, you will see a message warning you of this; click on **Discard** to tell the computer you don't want to save your changes.



Draw the butterfly

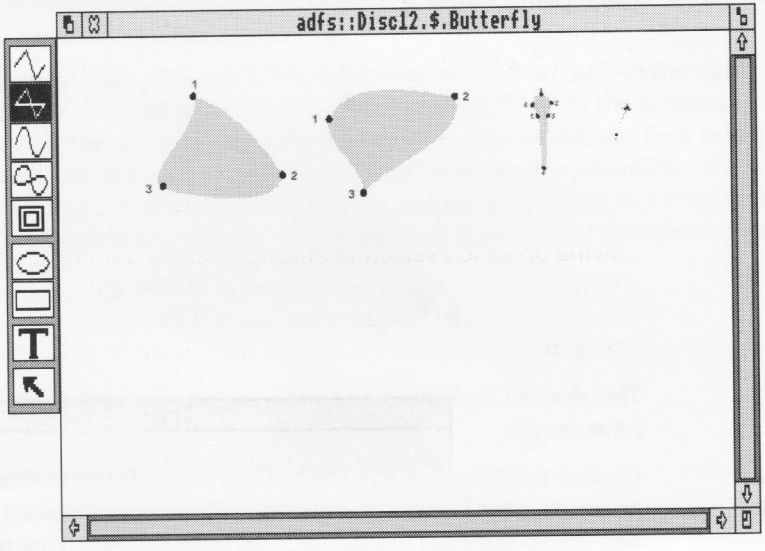


You're now ready to start on the main tutorial activity: drawing the butterfly.

On the App 2 disc or directory look for the **Tutorials** directory, open it and you will find a Draw file called `Butterfly`. The first thing you should do is to make a copy of this file to another disc, and work with the copy. We have copied ours onto a disc we have named Disc12, with the same filename, Butterfly. Save your work occasionally as you proceed.

Double-click on the icon for your copied file to load it into Draw. Press Menu on the Draw window that appears, move the pointer to **Zoom**, and rightwards to display the Magnifier box. Click on the righthand up-arrow to give a magnification of 1:2, and then click on the Toggle size icon at the top righthand corner of the window: this will enable you to see the whole file on the screen at once.

At the top of the window are four grey objects which serve as templates: you will trace them to form the two wing shapes, the body, and the antenna (you can do the eyes by yourself!). Below the templates there is a space where you will create your picture.



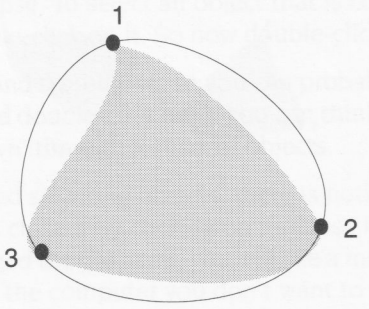
Draw the first wing

Call up the Magnifier box again, and set the magnification to 1:1 by clicking once on the righthand down-arrow. Use the scroll bars to move around the page until you see the upper wing template near the top lefthand corner of the page.

Click on the closed curve tool in the toolbox. When you move the pointer back onto the Draw window it changes shape to a star. To trace the wing, follow these steps:

1. Position the pointer over the top corner of the shape, at point 1. Click Select.
2. Without holding any mouse buttons, move the pointer to point 2. Click Select again.
3. Move the pointer to point 3, and double-click Select. This completes the path automatically, connecting point 3 to point 1.

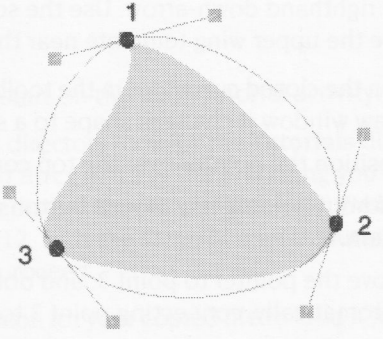
You have now drawn an outline shape like this, meeting the wing template at the three points where you clicked or double-clicked.



This doesn't look much like the wing yet. The next stage is to edit the shape you have drawn.

Choose the Select tool at the bottom of the Toolbox. The pointer changes back to an arrow. Click somewhere in one of the spaces between the grey wing template and the shape you have drawn. This selects your shape ready for editing. Now follow these steps:

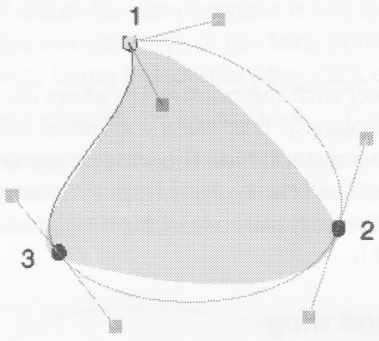
1 Press Menu and move to the Select submenu. Click on **Edit**. The shape now appears like this:



At each point where you clicked or double-clicked when creating the shape is a blue square (though they are superimposed on the black squares around the template). These are the **end points**. From each end point two lines sprout, each ending in an orange square. These are the **control points**. Use the control points (and the end points if necessary) to make your shape match the grey template, as follows:

2 Move the pointer over the top lefthand control point, and press Adjust. The leftmost segment of your shape will change to yellow. This means that the segment is selected for editing.

3 Using Adjust, drag the lefthand control point down and to the right. As you do so, the red segment changes shape, getting closer to the template. When it meets the concave curve of the template, release Adjust. Your selected segment will appear in green if its path crosses the template – this is just due to the combination of red and grey. You will also notice that the orange control point you moved is now yellow. None of these colour changes is significant in itself.



4 Move the pointer over the leftmost control point, and drag it with Adjust leftwards and downwards so that the selected segment matches the template as closely as possible.

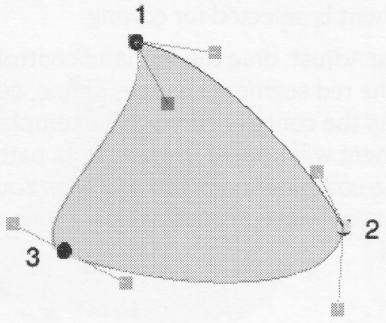
5 You may now need to return to the control point you moved first to adjust it again.

6 Repeat the process with the other control points, until the template and your path match.

Tips:

- If at any time you press the Select button by mistake, move the pointer over the shape and press Adjust; this is an alternative way of selecting an object for editing.
- If you have misplaced an end point, it can also be dragged using Adjust, until it is where you want it.
- If you make a mistake while drawing, use the **Undo** option in the **Misc** menu. Each time you click on Undo you erase any changes you have just made. Clicking on Undo twice erases the last two changes you have made. Choose **Redo** to reinstate the changes.

The template and your outline will now look like this:

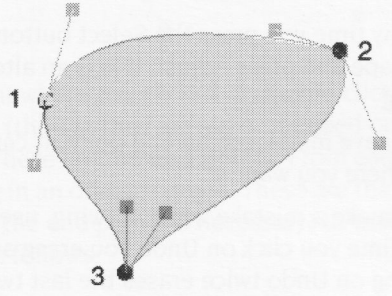


Click Select with the pointer anywhere on the Draw window (but away from the other templates). This takes you out of Edit mode. Choose the arrow tool again, move the pointer inside the wing shape and click Select to select it. Drag your outline up the screen, away from the template. It doesn't matter exactly where you leave it; the only purpose of moving it is to make it easier to select the next time you need it.

Draw the second wing

To create the second (lower) wing, the process is the same:

1. Select the closed curve tool again.
2. Draw the initial outline by clicking at the three marked points.
3. Choose the select tool (the arrow) and select the outline shape you have drawn.
4. Go into Edit mode by choosing **Edit** from the Select submenu.
5. Drag the control points so that your outline and the template look like this:



Again, click Select away from the template, select your outline of the second wing and drag it away from the template.

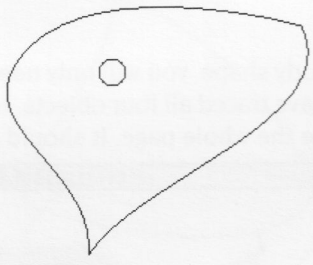
This wing will have a small circle on it; this is not provided on the template, as it is very easy for you to create. Follow these steps:

1 Press Menu and move to the **Grid** submenu. Using Adjust, click on **Lock**. The menu will remain on screen (because you clicked with Adjust instead of Select), and the word Lock will appear in the Title bar of the Draw window, indicating that the Grid Lock is on. The purpose of locking to the grid is to make it easier to use the ellipse tool as a circle tool.

2 Before drawing the circle, you must change the units of the grid; their default is 1/2 centimetres, which for our purposes is too coarse. While you still have the Grid menu on the screen, move to the **Inch** option and display the **Inch spacing** submenu. Using Select this time, click on **1 x 10**.

3 From the Toolbox, choose the ellipse tool.

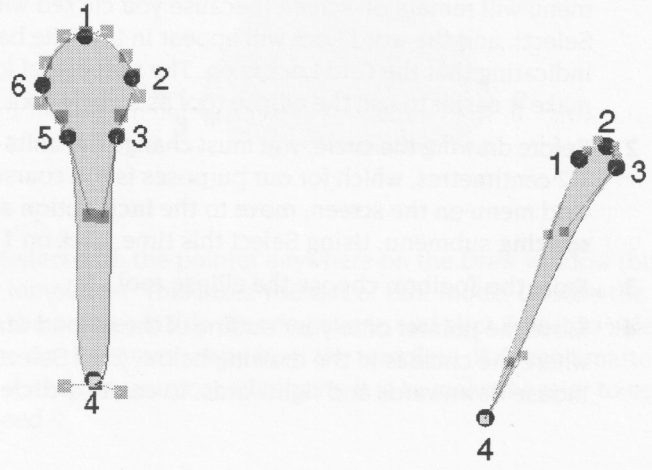
4 Move the pointer onto your outline of the second wing, and position it roughly where the circle is in the drawing below. Click Select once, then move the mouse downwards and rightwards, to create a circle like this:



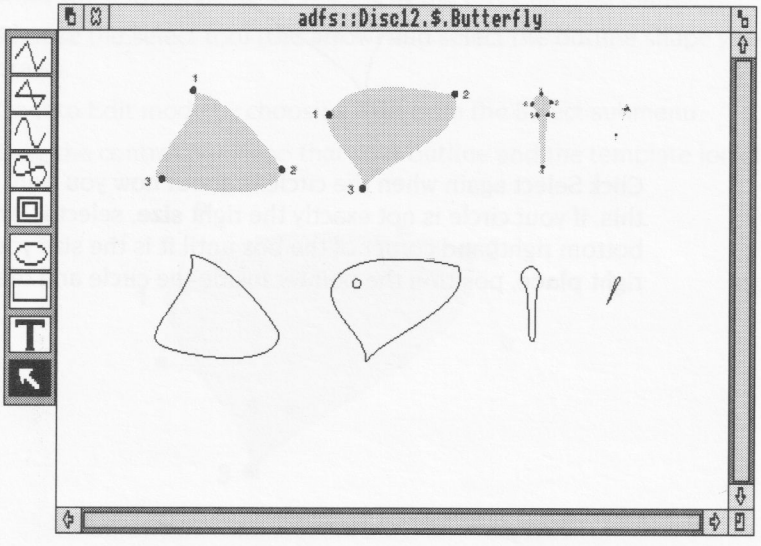
Click Select again when the circle is about how you want it. When you have done this, if your circle is not exactly the right **size**, select it, and drag the 'ear' at the bottom righthand corner of the box until it is the size you want. If it is not in the right **place**, position the pointer inside the circle and drag it with Select.

Draw the butterfly's body and antennae

Follow the same steps to trace the body and one of the antennae; templates are provided for each of these. Switch off grid lock before you start. For the antenna you will need to zoom in to a much larger magnification: try 4:1 or 5:1. The target positions for the control points are like this:



For editing the body shape, you will only need to move the control points attached to 4. When you have traced all four objects, reduce the magnification to 1:2 so that you can again see the whole page. It should look more or less like this:

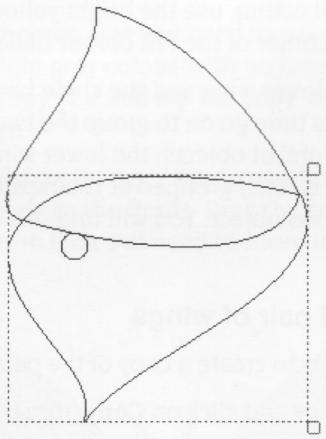


Start assembling the butterfly

From now on, you can ignore the grey templates, as you will just be working with your own shapes. The first task is to put the two wings together and create a mirror-image pair of wings. Use a magnification of 1:2 while you get the components into roughly the right place, then change to 2:1 or 1:1 to position them more accurately.

Before you move the lower wing, you should group the wing and the small circle together. Choose the select tool and start with the pointer above and to the left of the wing outline. Drag using Select to stretch a box around the two objects. When you release Select, they will both be selected. Click on **Group** in the Select submenu to group them together; they will then behave like one object until you ungroup them again. When you select a grouped object, it will have just one dotted box around it.

Now select your outline of the first (upper) wing, and if necessary drag it to a clear space. The window will scroll if you drag over its frame. Select the second wing, and drag it so that it is just below the first wing, with the points on the righthand side meeting, like this:



Colour the butterfly's wings

This is a suitable point at which to choose the colours for the butterfly's wings (before you make the second copy). First select the lower wing and ungroup the wing and the circle by selecting **Ungroup** from the Select menu.

Click Adjust outside the circle but inside the wing: this deselects the wing, leaving the circle selected.

Display the **Style** submenu. Carry out the following sequence of operations with Adjust, so that you do not have to keep redisplaying the menu.

1. Display the **Line colour** dialogue box. Click on **None**, then on **OK**.
2. Display the **Fill colour** dialogue box. Click on the orange box, next to the sky blue in the bottom righthand corner of the box. Using Select (since this is the last step in this sequence), click on **OK**.

Now to colour the wings themselves.

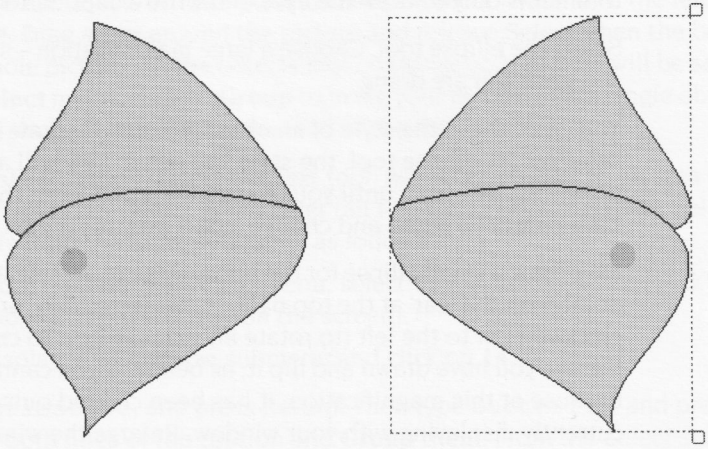
1. Select the two wings by clicking Select on one, then Adjust on the other.
2. Display the **Style** menu again.
3. Leave the line colour as it is (it is black by default).
4. For the fill colour, use the bright yellow (next to the royal blue in the bottom lefthand corner of the **Fill colour** dialogue box).

Now that the lower wing and the circle have been coloured, group them together again, and this time go on to group the two wings together as well. You now have a 'nested structure' of objects: the lower wing and the circle form a single grouped object, which is itself grouped at the next level up with the upper wing to produce another grouped object. You will find this multi-level grouping very useful when using Draw.

Create the second pair of wings

The next step is to create a copy of the pair of wings and turn it into a mirror image.

Select the wings and click on **Copy** from the **Select** menu. A copy of the wings will appear slightly below and to the right of the original. To flip the copy around its vertical axis, use the **Transform** submenu. Move to the **X scale** option and display the small box labelled **X scaling**. It will appear with the number 1.0 entered; change this to –1.0 and click on the box or press Return. The copied pair of wings will flip over, and you can drag them roughly into position:

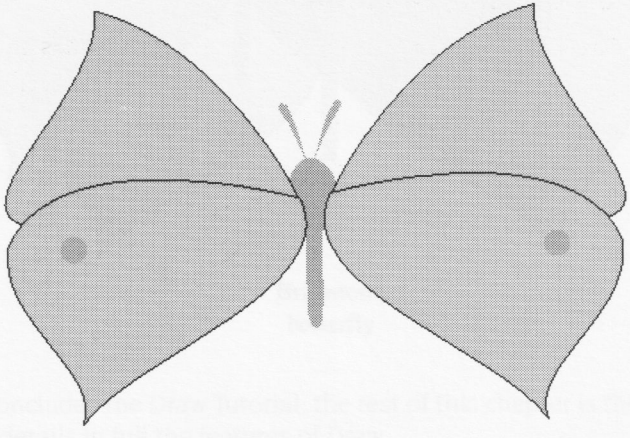


The copy will have the same grouping structure as the original.

Colour the body and assemble the butterfly

Using the same technique that you used to colour the wings, select the butterfly's body and give it a light grey colour, with no Line colour. Colour the antenna the same grey, make a copy of it and flip the copy, using the same technique as for the second pair of wings.

Select the body and drag it into position next to the first pair of wings (you may need to move the body to the front). Drag the second pair of wings and the antennae into position (you will need to zoom in to do this accurately – 2:1 should be enough):



Add the eyes

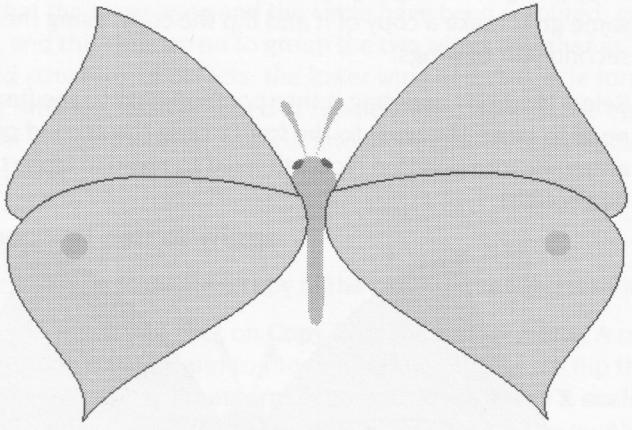
It remains only to draw the eyes and write a caption to your picture.

Select the ellipse tool. Choose a large magnification – such as 4:1 – so that you can see what you are doing.

You can choose the style of an object before you draw it. As you have already selected the ellipse tool, the style you select now will apply to any objects you draw with that tool, until you change the style. From the **Style** submenu, set the **Line colour** to **None** and choose a dark grey for the fill colour.

Now draw a small ellipse for the butterfly's eye. Rotate it if necessary by placing the pointer on the 'ear' at the top right of the dotted box, and dragging down (to rotate clockwise) or to the left (to rotate anti-clockwise). To create the second eye, copy the eye you have drawn and flip it, as before. If you cannot see the copy, this will be because at this magnification, it has been created outside the area you are currently displaying with your window. Enlarge the window or use the scroll bars (looking down and to the right of the original) until you find the copy. Move both eyes into position.

Return the magnification to 1:1; you can do this using Ctrl-D as an alternative to using the magnifier dialogue box.



Finish off and give your picture a caption

Choose the select tool and position the pointer above and to the left of your picture. Drag a box around the picture and release Select when the box encloses the whole picture. All the objects that comprise your picture will be selected. From the **Select** menu, click on **Group** to make your picture into a single object. Pressing F4 is a shortcut you can use instead of the menu.

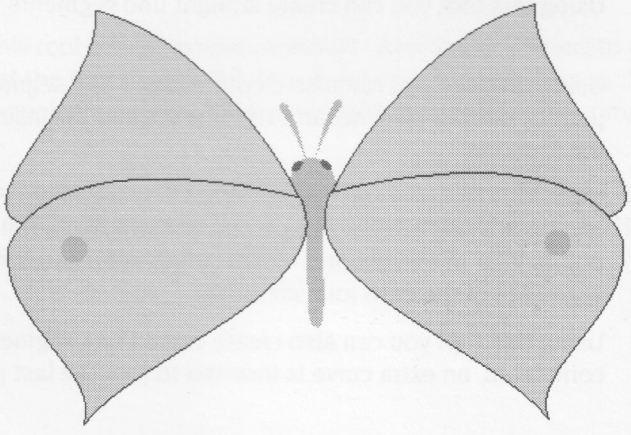
To create a caption, select the Text tool. Move the pointer to an area below your picture and click Select. A red caret (an I-shaped bar) will appear. Select a font for the title from the **Style** submenu, as follows:

1. From the **Font name** submenu, select `Trinity.Medium` (click with Adjust and the menu will stay on the screen).
2. Display the **Font size** submenu and click on **14**.

Type `Brimstone`, and press Return. Then type `butterfly`, and press Return. Select both lines of the caption and **Group** them. From the Select submenu, go to the **Justify** submenu and click on **Centre**.

Brimstone
butterfly

Finally, move the caption to the position you want next to your picture and group it with the picture.



Brimstone
butterfly

That concludes the Draw Tutorial; the rest of this chapter is the reference section, which details in full the features of Draw.

Draw reference section

In this section each of the Draw functions, including those you used in the tutorial, are explained in depth. Don't worry if you do not understand every last word; the real way to learn Draw is by using it.

Using the Toolbox

This gives an overview of how you can create and edit objects, and describes each object type on the Toolbox. When you are in the process of creating any object except text, you will see a 'skeleton' version of it on the screen.

Note that most operations can be cancelled by pressing Escape part way through.

The items in the Toolbox can also be chosen from the Enter submenu. This is outlined at the end of this section.

Paths

The top five icons in the toolbox are used for path objects. To construct line segments in a path, choose one of the first four icons (their meanings are given below), and click Select at the place in the Draw window where you want the path to start. Move to the end point of the line segment and click again. You can keep on adding line segments to the path by moving to the end point of each new line segment in turn and clicking. To finish creating the path, double-click or press Return.

Using this tool you can create straight line segments.

Using this tool you can also create straight line segments; when you complete the path by double-clicking, an extra line segment is inserted to join the last point to the first one.

Using this tool you can create curved line segments. A curve is defined by the two end points and two control points. You will find a fuller explanation of control points later in this chapter. When curves are created, they are arranged so that the segments of the path join smoothly.

Using this tool you can also create curved line segments; when the path is completed, an extra curve is inserted to join the last point to the first one.

This tool allows you to move from one point in the diagram to another without inserting a line. The move forms part of the path you are constructing. A path cannot start or end with a move, and cannot contain adjacent moves; that is, move may only be selected when a path is already in progress. Use Move to create an object consisting of subparts that you know you will always want to treat alike.

During the construction of a path, you can freely switch between these types of line; for example, you can construct a path which begins with a straight line, then has a curved line, then moves to another point, and finally closes with a straight line.

Ellipses and rectangles

The next two icons are used to create ellipses and rectangles. Initially these are aligned with the horizontal and vertical axes. However you can subsequently rotate them to any other angle. Ellipses and rectangles are in fact just a type of path: once you have created them, you can alter them in the same way as any other path.

You can use this tool to create an ellipse. Ellipses are arranged to fit within a rectangular area. Click Select to mark the centre of this area, then move the mouse to a corner of it and click Select again.

To create a circle, use the ellipse tool with the grid switched on.

Using this tool creates a rectangle. Click Select to mark one corner of the rectangle, then move the mouse to the other corner of it and click Select again.

Text

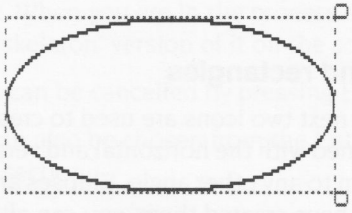
Using this tool creates one or more text objects. Click Select to place a caret where you want the text to start. While you are entering text, keys such as Delete have their normal effect. Press Return, or double-click Select to complete the text object.

When you are using anti-aliased fonts, you may find the Draw window takes a long time to scroll. To improve this, use the Task manager (described in the RISCOS 3 *User Guide*) to increase the size of the font cache.

Select mode

Click on the arrow tool at the bottom of the Toolbox to enter Select mode. With Select mode, you can make changes to objects which are already in the diagram. To return to Enter mode, click on one of the other toolbox icons.

To **select** an object, position the mouse over or within the object and click Select. When an object is selected, a dotted box is drawn round it, with ears at two of its corners.



You can select more than one object by clicking Adjust on each additional object. Clicking Adjust on an object that is already selected causes it to be deselected.

To **deselect** an object, click Adjust on it or click elsewhere on the screen.

Another way of selecting all the objects in an area of the diagram is to construct a **select box** round the area by pressing Select at one corner of the area to be selected and dragging the box out over the area. The position at which you press Select to start the box must be outside any objects. Release Select when all the objects to be selected are wholly or partly within the select box; the objects will then be selected. If you wish to select only objects that lie wholly within the selected box, use Shift-Select in the same way.

You may find that the object you want to select is obscured by another object. In this case, double-click Select over the object. Keep on doing this to 'tunnel' down to progressively deeper objects.

There are many operations that you can carry out in Select mode. Only the simplest ones are described here; for the others, see the section entitled *Editing existing objects using the Select menu* on page 56.

Moving an object

To move the selected objects, press Select over any of the selected objects and drag them to their destination; then release Select.

Rotating an object

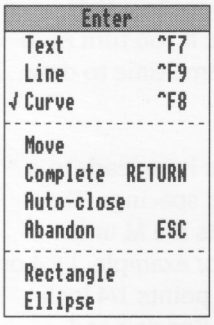
To rotate the selected objects, press Select over the ear at the top righthand corner of a select box, and drag the mouse until the objects are at the angle you want; then release Select. Each object rotates about its own centre. Note that text in System font cannot be rotated.

Scaling an object

To scale (or stretch) the selected objects, press Select over the ear at the bottom righthand corner of a select box and drag the mouse until the objects are the size you want; then release Select. You can use this to turn objects upside down, by dragging the mouse above the top of the box.

When you have more than one object selected, move, rotate and scale, apply to all selected objects.

The enter submenu



Exactly the same effects as those that can be chosen in the toolbox can also be chosen from the **Enter** submenu.

Text, **Rectangle** or **Ellipse** creates objects of the given type in exactly the same way as the Toolbox.

Line, **Curve** or **Move** construct paths, also using the same method as the Toolbox.

Complete to finish creating a path. This has the same effect as pressing Return at the end of a path.

Auto-close to set whether the path will be automatically closed when you complete it. If the line or curved line tool is selected, the Toolbox will change the selection to the corresponding closed path tool.

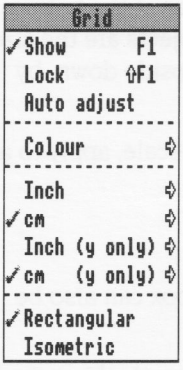
Abandon to abandon the path that you are constructing. It has the same effect as pressing Escape.

Using the Grid to place objects accurately

Draw can superimpose a rectangular or isometric grid on a drawing. This is often useful for lining up objects and for checking their relative size. The grid is made up of 'major points', which are marked by a cross, and 'minor points', which are marked by a dot.

You can use the grid either just as a general guide for drawing, or you can lock objects to it, so that they always align with points in the grid. When you are creating objects with grid lock turned on, you will see them attach to the nearest grid point to the mouse position.

The grid is controlled from the grid submenu:



Show displays the grid: click on it again to remove the display.

Lock switches grid lock on or off. The grid need not be shown in order to use grid lock. Grid lock causes new objects to align with the grid as you create them. If you move an object when the grid lock is on, its bounding box will move in jumps of the grid spacing. You can make existing objects lock to the grid by choosing **Snap to grid** from the Select menu.

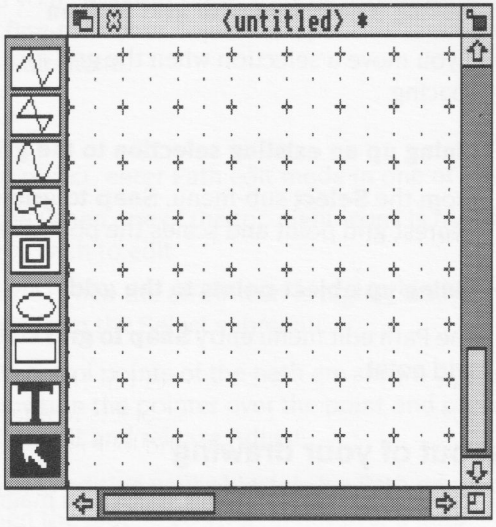
Auto adjust indicates whether Draw may change the grid if it is too dense or too sparse. When Auto adjust is turned on, Draw will insert extra minor points if the grid is very widely spaced, and remove points if they are very close together. Objects will lock only to the points that are currently displayed. If you turn Auto adjust off and specify a very close spacing, the grid may take some time to draw.

Colour sets the colour of the grid, from a range of values.

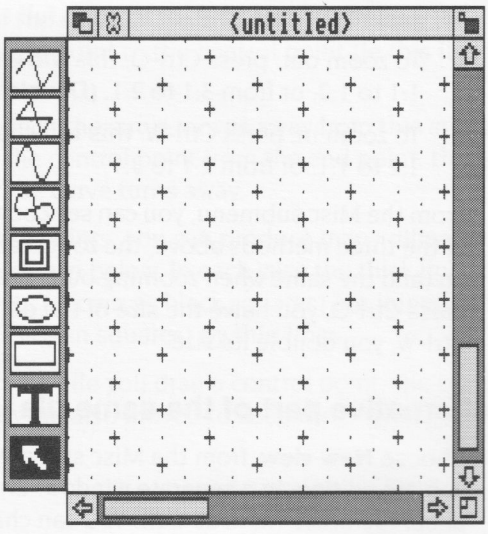
Inch and **cm** are used to set the spacing of the grid. Each menu item leads to a submenu, from which you can select one of a range of standard spacings. The standard spacings are expressed in the form M x S: major points are M units (inches or centimetres) apart and divided into S subdivisions; for example, 1 x 4 on the inches menu gives major points one inch apart, and minor points 1/4 inch apart. You can define your own spacing by typing values to the Spacing and Subdivision submenus. Choosing **Inch** or **cm** from the Grid submenu (without moving to Inch or cm submenus) uses the last setting you specified in that unit. For rectangular grids, changing the grid settings in this way changes both the X (horizontal) and Y (vertical) settings.

Inch (y only) and **cm (y only)** allow you to set a different grid setting in the Y direction from that in the X direction.

Rectangular sets the grid to a rectangular pattern.



Isometric sets the grid to an isometric pattern. In this case, the Y spacing of the grid is not used. For reasons of clarity, only those minor points lying on lines joining major points are shown; however, when grid lock is in use, the drawing still locks to intermediate minor points between them.



Advanced details

Moving a selection with grid lock on

If you move a selection when the grid lock is on, it moves in jumps of the grid spacing.

Lining up an existing selection to the grid

From the **Select** sub-menu, **Snap to grid** snaps the object's bounding box to the nearest grid point and scales the points in the object to fit the new bounding box.

Lining up object points to the grid

The Path edit menu entry **Snap to grid** snaps each point individually to the nearest grid point.

Zooming in and out of your drawing

Zoom, on the main menu, leads to a magnifier dialogue box. This can be used to change the size at which objects are displayed relative to their actual size. You cannot set either part of the zoom ratio to a value greater than 8; if you try to do so, 8 is used instead. There are three other ways of zooming:

- If you want to enlarge a particular area of your work, hold Shift and use Adjust to drag a box around the area you want. The window will expand if necessary and the zoom factors will be set appropriately. To return to your previous scaling, press Ctrl-R, or to go to full size (1:1), press Ctrl-D.
- To zoom out, press Ctrl-Q: this will change the zoom factor from, for example, 1:1 to 1:2, or from 3:1 to 2:1. (Double clicking Shift-Adjust has a similar effect).
- To zoom in, press Ctrl-W: this will change the zoom factor from, for example, 1:2 to 1:1, or from 2:1 to 3:1.

From the Misc submenu, you can set Zoom lock x2. When you then zoom using one of the three methods above, the zoom ratio is forced to 1:1, 1:2, 1:4, or 1:8, and so on (and the same when zooming out). This means, for example, that each time you press Ctrl-Q, you halve the size of the drawing on the screen. When you press Ctrl-W, you double its size.

Displaying an alternative part of the same file

Choose **New view**, from the Misc sub-menu, to create a new view of the diagram you are editing, in a separate window. Changes made in any view of a diagram affect the other views as well. You can change the zoom on each view independently, use different grids in the separate views, scroll each one independently, and so on. To get rid of a view, close the window containing it.

Editing objects

When you designed your object in Draw, you constructed it out of paths; you can edit these paths to fine-tune your object's shape. This is done using Path edit mode and the Path edit menu.

Path edit mode

To start editing your object, enter Path edit mode in one of the following ways:

- From Enter mode (when one of the top eight icons is highlighted), click Adjust on the object you wish to edit.
- From Select mode (when the arrow icon is highlighted), first select an object, then choose **Edit** from the Select submenu.

The end points and control points of the path are shown on the screen. To move any of the points, position the pointer over the point and press Adjust. Drag the point to where you want it and release Adjust.

When you have finished editing your object, leave Path edit mode by clicking Select or Adjust when the mouse position is not over a path.

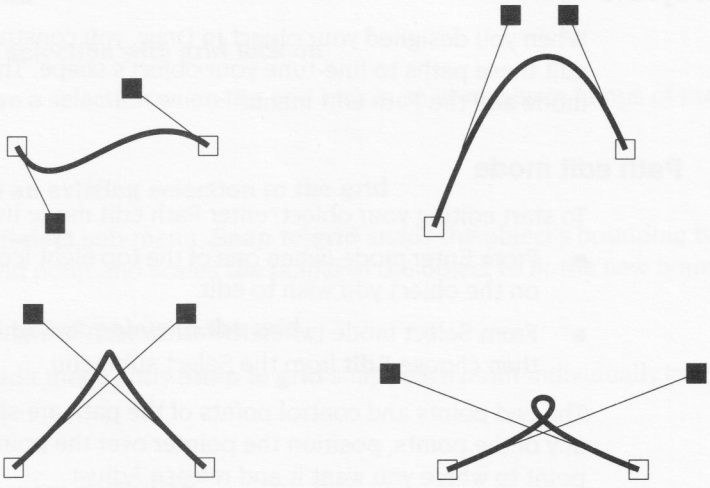
Editing curves

Curves in a path object are defined by two end points and two control points. When you are drawing or editing a path, the control points are shown connected to the end points by straight lines. The shape of a curve is determined as follows:

- The direction of the curve at the end point lies along the straight line connecting the end point to the control point (ie this line is a tangent to the curve).
- The degree to which the curve moves away from this straight line depends on the distance of the control point from the end point: the nearer together they are, the sooner the curve turns away.

By moving the control points, you can produce many different shapes of curve. Some examples are shown below. In each case the thick line shows the path itself, and the control points (shown as black squares) are joined to the corresponding end points (shown as open squares) by thin lines.

If you hold down Shift while you drag a control point, the corresponding control point in the next curve is also moved to keep the angle of join constant.



Editing text lines

When typing in text, you can only delete text and type new text in if you are still on the same line. As soon as you press Return the line is frozen. To edit a text line once it is frozen use the following procedure:

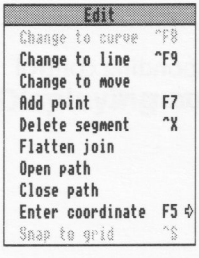
1 From Select mode (when the arrow icon is highlighted) first select the text line by clicking over it.

2 Use the **Select** menu to move to the **Edit** option and display the **Text** box.

3 Change the text in the text box and when you have finished press Return and the text is changed.

Text areas and Paint images (sprites) cannot be edited within Draw. Text areas should be exported to Edit and edited. Paint images (sprites) should be exported to Paint and edited.

The Path edit submenu



To view the Path edit menu, first enter Path edit mode as explained above. If the path you want to edit is under another object's path, clicking Adjust over that path will find the next deeper path in the diagram if there is one. This is similar to tunnelling through objects in a selection.

Select part of a path by clicking Adjust on an end point or a control point of the path. The selected line segment is highlighted. (Note that if you select the first point of the path, there is no highlighting). You can now click Menu to show the list of Path edit actions:

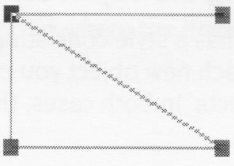
Change to curve turns the selected part of the path into a curved line segment. You can use it when the selected segment is a line, or when you have selected a point inserted using the move icon (or **Move** from the Enter menu).

Change to line similarly changes a curved line segment or a Move into a straight line segment.

Change to move replaces the selected straight or curved line segment with a move, effectively splitting the path into two sections. However, you cannot change a line segment to a move if it appears at an end of the path, or if it is already preceded or followed by a move.

If the path containing the line was closed, extra lines will be inserted to close each of the two sections of the path. The following example illustrates this. First, draw a rectangle, starting at the top lefthand corner and working clockwise, then enter Path edit mode. Click Adjust at corner 3: this selects side 2-3 for editing.

Click Menu and choose **Change to move**. Side 2-3 is now replaced by a Move, and corners 1 and 3 are joined.



Add point inserts a new point (and hence a new line segment) into the path, of the same type as the selected segment.

Delete segment deletes the selected line segment from the path.

Flatten join straightens the join between two lines (unless they are both straight lines). The curve is adjusted so that the tangent is continuous at that point.

Open path and **Close path** turn open paths into closed ones, and vice versa. In making a path open, the line segment joining the last point to the first one is not deleted; it is just 'disconnected'. On closing a path, the end point of the last line segment is moved to join up to the first segment.

Enter coordinate leads to a dialogue box which shows the current coordinates of the point. You can select the unit the coordinates are shown in by clicking on the Inches and Centimetres buttons. To change the coordinate, type in the new value and click **OK**. To leave the coordinate unchanged, click **Cancel** or press Escape. If the point you have chosen is the start point of the path, only **Enter coordinate** is available.

Snap to grid causes the selected object to align with the grid.

To leave Path edit mode, click Select elsewhere in the diagram.

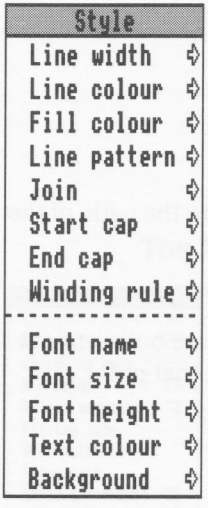
Cancelling your last operation

Undo cancels the last operation you carried out, restoring your work to its previous state.

Redo cancels Undo, if you decide you were right after all.

Changing the way an object looks – its style

Setting and editing the object style



Each object has a style consisting of a set of attributes. You can set the style to be applied to each new object you create (the default style), and alter the style of existing objects. In both cases, the style is chosen from the Style submenu of the Draw menu.

The style chosen from the Style menu is the default style; all new objects created will be given this style.

To change the style of existing objects, first select the objects you want to change and then change the default style settings.

The Style menu contains the following entries. Each entry has a submenu giving the range of values available.

Line width. You can set the line width to any of a range of predefined values, measured in points (a point is 1/72 inch), or to 'Thin', which means that the line will always appear in the narrowest width possible. You can use the last position in the menu to type in a value for the thickness if the one you want is not in the menu. Line width applies to paths.

Note that the line width 'Thin' means 'as thin as the output device can manage'. This results in different line thicknesses on different output devices. It is more sensible to use 0.25 points as the default line thickness for a thin line, especially if you will be printing on a typesetter. A 'Thin' line on a 1200dpi imagesetter will be too thin to reproduce subsequently on a litho printer.

Line colour and **Fill colour** are both set using a colour dialogue box. See the chapter entitled *Introducing the Applications Suite* for details, but note the following:

- The fill colour applies to the region within the object.
- For a simple line drawing, with no interior, use **None** as the fill colour.
- Line and fill colours apply to paths.
- Open paths may be filled.

Line pattern is used for dashed and dotted lines. You can set the line pattern to any of a range of patterns, including solid. The pattern applies to paths, rectangles and ellipses.

Dashed and dotted lines can be modified using the Start cap and End cap options.

Join sets how lines are joined together:

A mitred join brings the outer edges of lines together at a point:

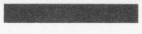
A round join rounds off the point where the lines join:

A bevelled join cuts off the corner where the lines join:

The join style only has a significant effect for thick lines.

Start cap and **End cap** determine what the ends of lines look like. Caps apply only to open paths, and their effect is only significant for thick lines. The following are the cap styles:

Butt caps square off the line at the end point.



Round caps add a semicircular arc to the end of the line. The diameter of the arc is the same as the width of the line.

Square caps add a square to the end of the line. The square has half the width of the line.

Triangle caps add a triangle to the end of the line. The triangle option has its own submenu allowing you to set the height and width of the triangle independently, these values being multiples of the width of the main line. Use this option to create lines with arrowheads.

In a path, the same style applies to all the line segments.

Note, to generate arrow heads of a reasonable size from start triangle caps and end triangle caps options, you should use values of at least x4 on a 0.5 point line width.

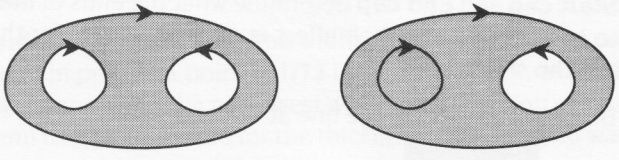
Winding rule is only used for areas (ie parts of the diagram bounded by lines) for which a fill colour has been set. Even-odd winding means (roughly) that an area is filled if it is enclosed by an even number (including zero) of areas. Non-zero winding, on the other hand, fills areas on the basis of the direction in which the paths that surround the area were constructed: if an equal number of paths in each direction surround the area, it is not filled, otherwise it is. Most of the time, the even-odd winding rule is used.

More formally, the two winding rules are defined as follows:

Even-odd: to determine whether an area of a object is to be filled, imagine a line passing from inside the area to outside the object. Count the number of lines it crosses. If the number is odd, fill the section.

Non-zero: first assign each path a direction, expressed as a number: +1 for one direction and –1 for the other. Then, to see if an area is to be filled, construct an imaginary line from inside the area to outside the figure. Keep a total of the direction values for each line it crosses. If the total is non-zero, fill the section.

These pictures illustrate the two winding rules:



Even-odd Non-zero

Note that each of these drawings is a single object, consisting of a single path containing two moves (the first from the outer line to one of the 'eyes', the second from one eye to the other). The arrows show the direction in which each segment of the path was drawn.

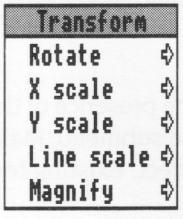
Font name applies to text objects. You can set the font either to the system font, or to an outline font. The list of fonts shows all those that Draw could find when it was loaded. See the RISC OS 3 *User Guide* for more details about how fonts work.

Font size and **Font height** also apply to text objects. Both values are measured in points (1/72 inch units). You can use the last position in the menu to type in a value if the size or height you want is not already there. Changing the size causes the height to be set to the same value; you can subsequently change the height, leaving the font width set to the size value. System font is 6.4 point wide and 12.8 point high by default.

Text colour is used to set the colour of the text, and the initial text colour of text areas. It is set using a colour dialogue box.

Background is used for setting the intermediate colours used in displaying anti-aliased fonts. You should set this to the same colour as the part of the diagram that the text appears in. For example, if you set the text colour to green and the background to blue, the anti-aliasing pixels will be in a range of shades between green and blue. The background applies to text objects and text areas, and is set using a colour dialogue box.

Rotating and enlarging objects accurately



To rotate or enlarge objects by specific amounts, first select the object(s), then use the **Transform** submenu, reached from the main menu. This provides the following options:

Rotate leads to a submenu into which you can type a rotation angle, measured in degrees. All selected objects are rotated anticlockwise by this angle. Alternatively, you can group the objects and drag on the top righthand ear. You cannot rotate text areas or text lines in System font. See page 57 for information about converting text objects to paths.

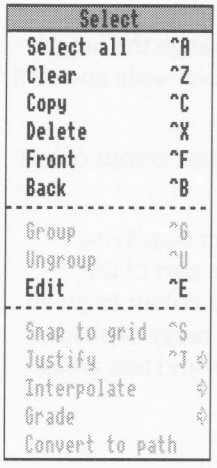
X scale and **Y scale** lead to submenus into which you can type scale factors. All selected objects are scaled in size by this amount, in the given direction (X = horizontal, Y = vertical). The scaling is relative to the current size. Line widths are not scaled.

Line scale leads to a box in which you can enter a scale factor for the line widths of the selected paths. The scaling is relative to the current size. Lines of width 'Thin' cannot be scaled.

Magnify applies all three scalings – X, Y and Line – to the selected objects (though lines are left unchanged if their width is set to Thin).

Editing existing objects using the Select menu

Select mode is used to alter existing objects. You can enter Select mode from the Toolbox (click on the arrow icon), or choose Select from the Draw menu. The Select submenu contains a number of operations that you can apply to the currently selected objects:



Select all selects all objects in the diagram.

Clear deselects all selected objects.

Copy makes a copy of the selected objects, slightly offset from the originals.

Delete deletes all the selected objects.

Front moves the selected objects so that they are at the front of the diagram, obscuring any other objects in the same physical position.

Back moves the selected objects so that they are at the back of the diagram, obscured by any other objects in the same physical position.

Group turns the selected objects into a group object.

Ungroup breaks down a group into the objects that make it up. Ungroup only has an effect when there are groups in the selection.

Edit has two functions. When there is a single path object selected, it provides a means of entering Path Edit mode. The effect is the same as clicking Adjust on the path object when in Enter mode. When there is a single text line selected, it leads to an edit box in which the text line can be edited.

When a piece of text is selected, an arrow will appear, signalling the presence of the submenu **Text**. The selected text will appear in the **Text** box off the submenu. Make your edits to the text, then press Return for the changes to take effect. Existing text cannot be edited directly in a Draw file.

Snap to grid applies only if the grid is locked. It causes the selected objects and each point in them to move to the nearest grid point. In the case of text objects, it is the base line of the characters that will align with the grid.

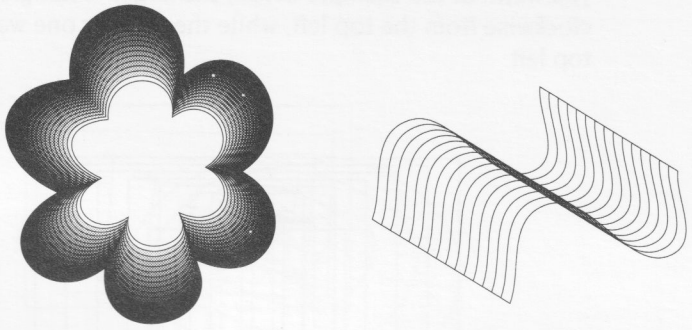
Justify applies to groups. It leads to a submenu from which you can select how the objects forming the group are arranged within the bounding box of the group object: at the left, centred or at the right horizontally, and at the top, positioned in the middle, or at the bottom vertically.

Convert to path can be applied to a text object to convert it into a normal path. Each letter in the text line is an object, though when you first make the conversion they will be grouped together. Once you have converted a text line to a path, it can be treated like any other path object, and you can also use the options in the Style menu that apply to objects other than text. For example, you can create hollow text by setting a solid line colour and no fill colour.

Note, you can only convert outline fonts to a path.

Interpolation and grading

Draw provides you with two ways of creating interesting effects by taking a pair of objects and inserting similar objects between them. All you have to do is to create two objects, group them, and choose **Interpolate** or **Grade** from the Select menu. Each option leads to a submenu into which you can type the number of objects to insert between the two you have drawn yourself (the default is eight, and the maximum is 255). Here are two simple examples to start with:

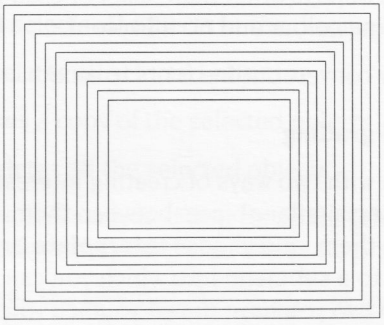


A pair of path objects for interpolation or grading must have certain properties in common. For most practical purposes, this means they should be more or less the same shape (though they need not be the same size): two V-shapes, two rectangles, and so on. Specifically, the requirements are that

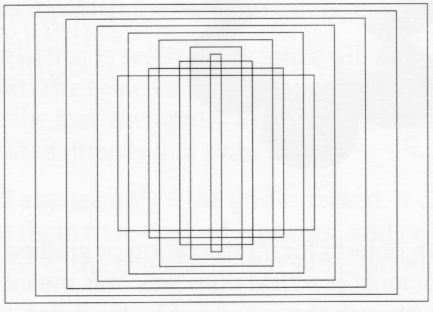
- for each line or curve in one, there must be a line or curve in the other
- for each move in one, there must be a move in the other
- for each close in one, there must be a close in the other.

The path objects must be single path objects; they cannot be grouped path objects.

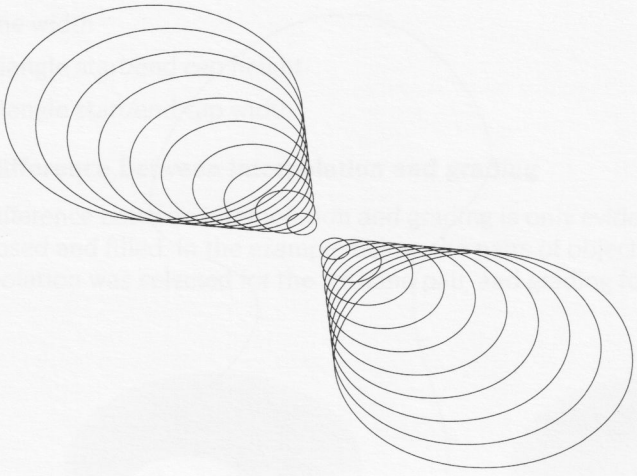
The order in which you draw the objects is significant. This is particularly important when you are interpolating between rectangles and ellipses; usually, you should create them in the same way (for example, start at the top lefthand corner and move round clockwise). This will produce an interpolation like this:



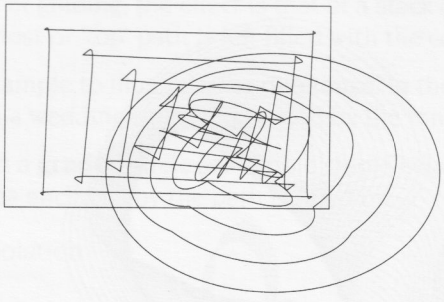
However, creating the objects in a different order (or rotating the copy before you group the two objects) can make some interesting patterns which may be just what you want. In the example below, the larger rectangle was created by drawing clockwise from the top left, while the smaller one was drawn anti-clockwise from top left.



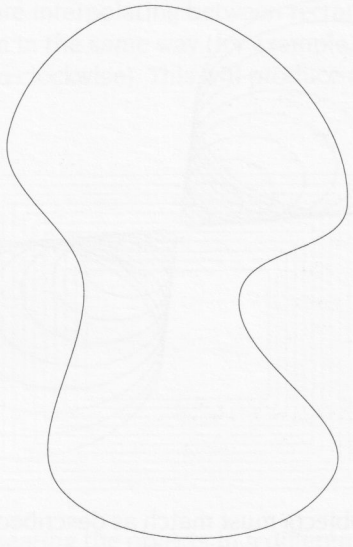
For the next example, an ellipse was drawn and copied, but the copy was rotated 180° before grouping and interpolating:



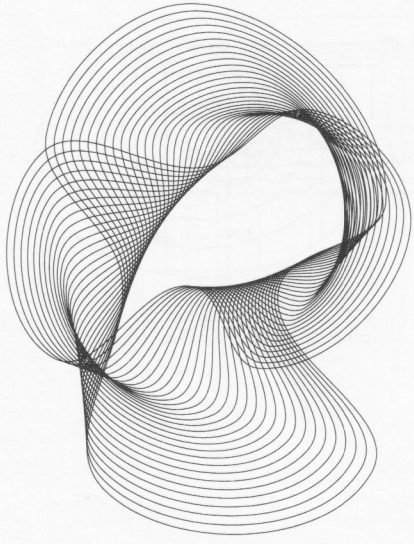
Although the two objects must match as described above, this does not mean they have to be the same type of object. The next example was created by grouping a rectangle and an ellipse, and interpolating 10 objects:



You can achieve some particularly attractive effects by drawing an object, copying it, and rotating the copy. The next example started with this closed curve:



This was then copied, and the copy shrunk by about one-third and rotated by about 90°. The original and copy were then grouped, and interpolation with 30 objects carried out. The result looks like this:

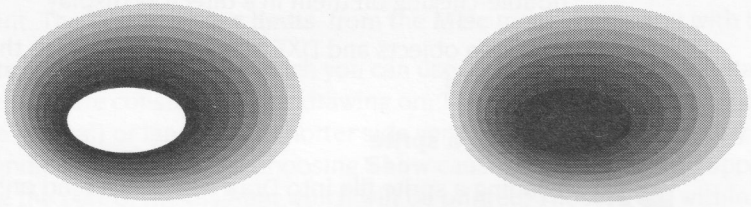


The properties used by interpolation and grading are

- line colour
- fill colour
- line width
- triangle start/end cap height
- triangle start/end cap width.

The difference between interpolation and grading

The difference between interpolation and grading is only evident when the shapes are closed and filled. In the example below, the pairs of objects are identical, but interpolation was selected for the lefthand pair, and grading for the righthand pair.



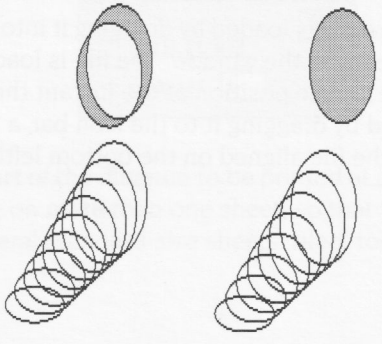
In the case of interpolation, the innermost path is unfilled, but the fill colour you assigned to it is used to fill the ring or doughnut shape between the innermost path and the next one out. The same process is followed, producing a tunnel effect.

In the case of grading, the effect is that of a stack of solid discs, rather than rings. The innermost or 'top' path is left filled with the colour you gave it.

Another example to illustrate the difference. In the **interpolation** of the circle, the band, as in a wedding ring, constructed by the innermost path is filled.

The rings in a **graded** circle are simple single edged paths enclosing each other and the area enclosed by the path is filled in.

Interpolation



Grading

If you interpolate two objects using N gradations, a total of N objects will now exist. Each object consists of two objects grouped together that cannot be ungrouped.

Loading and saving Draw files

Draw can load four types of file:

- Files in Draw's own file format.
- Sprite files, containing one or more sprite objects (from Paint, for example).
- Text files, used to create text area objects (from Edit, for example).
- DXF files.

All the file types can be loaded by dragging the file to the Draw icon on the icon bar, or by dragging it into a Draw window. Draw files can also be loaded by double-clicking on them in a directory display.

Text area objects and DXF files are discussed in the section entitled *Text area objects* on page 64.

Loading a sprite

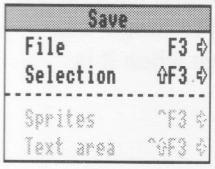
Loading a sprite file into Draw will in fact load only the first sprite. A more convenient method of loading a single sprite is to:

1. Load the sprite file into Paint (following the instructions in the chapter on Paint).
2. Open a sprite window for the sprite you wish to transfer.
3. Click Menu and move to the **Edit** submenu. If Palette is not switched on (ie there is no tick beside it), click on Palette to give the sprite its own palette.
4. Choose **Save**, then **Sprite**.
5. Drag the icon in the **Save as** box into a Draw window.

This method also ensures that Draw displays the sprite in the correct colours.

When a file is loaded by dragging it into a window, it is added to the diagram which is already in the window. The file is loaded so that its bottom lefthand corner lies at the mouse position at the instant the mouse button is released. When a file is loaded by dragging it to the icon bar, a new diagram is created in a new window, with the file aligned on the bottom lefthand corner of the diagram.

Saving files from Draw



To save files from Draw, use the **Save** option in the Draw menu. This leads to a submenu with the following entries:

File saves the entire diagram in Draw file format.

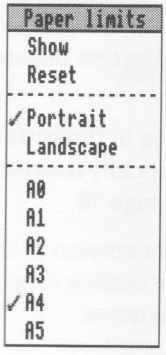
Selection saves the currently selected objects as a Draw file.

Sprites saves all selected sprites as a sprite file.

Text area saves the text used to define a text area, as a text file. There must be a single text area selected. For more information about text areas, see the section entitled *Text area objects* on page 64.

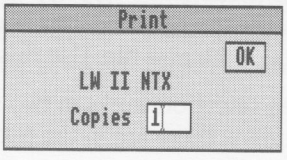
Printing Draw files

First you must make sure that your drawing will fit on the paper on which you are going to print. The option **Paper limits**, from the **Misc** menu, helps you with this.



Paper limits leads to a submenu which you can use to set the size and orientation of the 'paper' you are constructing the drawing on. The orientation is either portrait (longer side vertical) or landscape (shorter side vertical). The size may be any of a range of standard 'A' paper sizes. Choosing **Show** causes a grey border to appear surrounding the part of the diagram which will be printed. Those areas within the grey border are considered to be part of the margin of the page, and are not printed. The limits of the grey border correspond to the limits of the page. If no printer driver is loaded, the limits default to A4. When you load a file into Draw, the paper size is set to the value which most closely matches the area defined by the file. **Reset** sets the paper limits to the printer driver defaults.

Print leads to a dialogue box which you can use to print the diagram. The printer dialogue box contains the name of the printer driver in use, a box into which you can enter the number of copies to be printed, and a button to start the printing process.



You can also select **part** of the diagram to be printed at a time. This option enables you to print a drawing on more than one sheet, so that you can make up a poster, for example, from several standard-size sheets 'tiled' together.

First click on **Show** in the Paper limits submenu. Then hold Ctrl and click Select to mark the bottom lefthand corner of the printed area, or hold Ctrl and click Adjust to mark the top righthand corner. Hold Ctrl and drag with Select to drag a box around the area you want to print; it will be scaled to fill the page when it is printed.

Text area objects

A **text area** is a special sort of object that allows you to do simple 'desktop publishing'. A text area consists of a piece of text divided into one or more rectangular regions called **text columns**. Draw breaks up the text into lines which are just wide enough to fit into the columns, splitting it (principally) at spaces. A text area may have more than one column. Draw again works out how to divide the text between the columns, filling up each one before moving to the next.

Create a text area by using a text editor (such as Edit) to prepare a file containing the text, annotated with special commands (described below). When the text file is loaded into a Draw diagram, the text is formatted into columns. The number of columns is given by an annotation. By using Select mode, you can move the text columns and change their size. As you do this, Draw will reformat the text between the columns.

Text areas only use anti-aliased fonts: you cannot create a text area in the system font. If you try to use the system font you will find that it is automatically converted into the Trinity font. See the sub-section *Default text area header* on page 70.

If you wish to create a text area in system font, use the outline font version of the system font instead of the normal system font. You can choose the outline version, *called* ***System Fixed****, from the* ***Font name*** *sub-menu off the* ***Style*** *menu.*

Creating and editing text areas

To create a text area object from a text file, drag the file into a Draw window. The columns in the text area are initially set up to standard sizes. If you drag the text file over the top of an existing text area, the old text in the area is replaced with the contents of the new file. Use this method for altering the text in a text area.

Text area selection works in two slightly different ways, depending on how many text columns there are in the text area:

- When there is a single text column in the text area, selection works in the same way as any other object. You can move the text area, scale it, change its style, and so on, as described above.

- When there is more than one text column, selection is a two-stage process. When you first click Select (or Adjust, in multiple object selection) over the text area, the entire area is selected. You can move the area, but it cannot be scaled. Double-click Select (or Adjust) to select a column of the text area. The individual columns can be moved and scaled. Their new position and size need not lie within the original text area. When the size of a text column changes, the text is reformatted to fit the new size of the column. At the end of the operation, the bounding box of the text area is changed to reflect any changes made to the column; it is arranged to contain all of the text columns, with a small additional border. To select more than one column of a text area, select the first as described above, and select further ones by first clicking Adjust and then double-clicking Select over the column.

Text areas and text columns cannot be rotated.

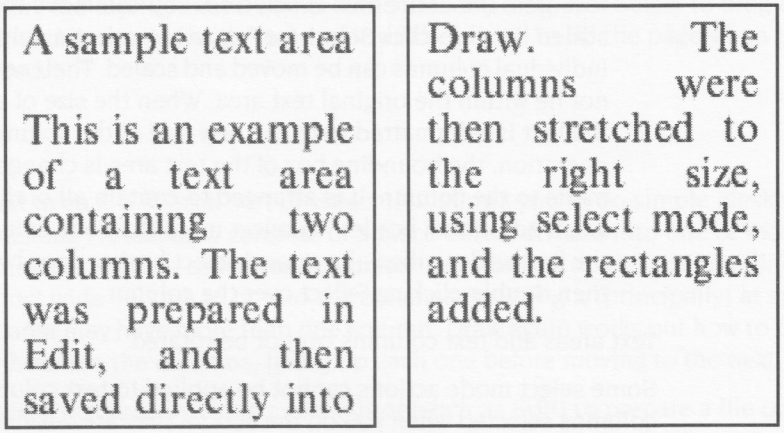
Some select mode actions cannot be applied to text columns. If there are any text columns selected when you do the action, they are deselected first. An example of this is object deletion: you can delete a text area as a whole, but not a text column from within it.

An example

The text shown below, typed into Edit and loaded into Draw as an Edit file, creates the text area shown overleaf:

```
\! 1
\AD
\D2
\F0 Trinity.Medium 24
\L24
\P24
\0A sample text area

This is an example of a text area containing two columns.
The text was prepared in Edit, and then saved directly
into Draw. The columns were then stretched to the right
size, using select mode, and the rectangles added.
```


A sample text area
This is an example of a text area containing two columns. The text was prepared in Edit, and then saved directly into
Draw. The columns were then stretched to the right size, using select mode, and the rectangles added.

The appearance of a text area is determined from commands which are included in the text used to create it. Each command starts with a backslash (\) character. The full list of sequences is given below, but the following is a brief description of the commands used in the example.

- \! 1 tells Draw that this is a text area.
- \AD causes the text to be justified to left and right in its columns.
- \D2 indicates the number of columns to be used.
- \F0 Trinity.Medium 24 specifies font 0 as Trinity.Medium, 24 point.
- \L24 sets the line spacing to 24 points.
- \P24 sets the spacing between paragraphs to 24 point. In this example, this just affects the space after the title.
- \0 selects font 0 for the following text.

Text area commands

The following is a complete list of text area commands. Some commands must be terminated with either a newline or a slash (/) character. Others do not need a terminator (for example, where the command has a fixed number of characters), but may optionally end with a slash character. For clarity, it is often useful to include it. Note especially that **all commands are case sensitive**: this is unusual in RISC OS and applications written for it.

In the following descriptions

- Items in italics (for example *code*) indicate a parameter you must supply.
- Items in square brackets are optional (for example `[/]` indicates an optional slash character).
- Commands and parameters must normally be separated by spaces (though there does not have to be a space between the command and the first parameter).
- `nl` means a single newline character, and `nl/` means newline or /.

The full list of annotations is as follows:

Command	Effect
\! *version* nl/	This is a special line which must appear at the start of any file which is to be used for a text area. *version* must be 1. However, it forms part of a default header which is inserted at the start of the text; this is described below.
\A *code* [/]	Set alignment. *code* may be L (left aligned), R (right aligned), C (centred) or D (double, ie justified to both margins). An alignment setting forces a line break. The default setting is left aligned.
\B *red green blue* nl/	Set the background colour to the given red/green/blue intensity, or the best available approximation. Each intensity is in the range 0 to 255; values outside this range will be limited to it (ie a value set higher than 255 will be realised as 255; a value set to less than 0 will be realised as 0). Background colour is used in the same way as for text objects; you should set it to be the same as the area of the drawing that the text area is to appear in front of (the text area itself is effectively transparent). The default is the background style attribute of the text area object, normally white (equivalent to `\B 255 255 255`).

Command	Effect
\C *red green blue* nl/	Set the text colour to the given red/green/blue intensity, or the best available approximation. Each intensity is in the range 0 to 255; values outside this range will be limited to it. The default is the text colour style attribute of the text area object, normally black (equivalent to `\C 0 0 0`).
\D *columns* nl/	Indicates that the text area is to contain the indicated number of columns. This must appear before any printing text. The default is 1.
\F *font-number name size* [*width*] nl/	Defines a font reference. `font-number` is either one or two digits. The font number is used subsequently to set the font. `name` is a font name such as Trinity.Medium. `size` and `width` are the height and width of the font in points. If `width` is omitted, the size is used for both height and width. There are no defaults.
font-number [/]	Indicates that the text from the point at which the command appears is to appear in the specified font. If the font is not available when the text is being drawn, the effect is undefined. Draw will attempt to check that the font number and the corresponding definition are reasonable. There is no default.
\L *line-spacing* nl/	Sets the line spacing (the distance from the base of the characters in one line to the base of the characters in the next) to the given value, measured in points. Line spacing changes take effect from the end of the output line in which the command appears. The default is 10 points.
\M *left-margin right-margin* nl	Sets the left and right margins to the given values, measured in points. If the total size of the margins is greater than the width of the column, no text is displayed. Margin settings apply from the end of the output line in which the command appears. The default is 1 point at each side.
\P *paragraph-spacing* nl	Sets the extra space inserted between paragraphs to the given value, measured in points. Paragraph spacing changes take effect from the end of the output paragraph in which they appear. The default is 10 points.

Command	Effect
\U *position thickness* nl	Switches on underlining, at the given position relative to the base of the characters. `position` is limited to the range –128 to 127, and `thickness` to the range 0 to 255. Both values are measured in units of 1/256 of the current font size. Underlining may be turned off by specifying a thickness of 0.
\U. [/]	An alternative way of turning underlining off.
\V[-] *vertical-move* [/]	Moves the following text by the given amount, measured in points, relative to the current character position. This is intended for superscripts and subscripts; use positive values for superscripts, negative values for subscripts.
\-	Inserts a soft hyphen. This tells Draw that it may split the word at this point if necessary, inserting a hyphen character in the output. If the word is not split at the soft hyphen, it has no printing effect.
\nl	Forces a line break.
\\	Inserts a backslash character.
\;*text* nl	Treated as a comment. Characters up to and including the next newline are ignored.

Rules for displaying text

Line splitting

Draw displays text in text areas by splitting it into lines and columns. When working out where to split the text, Draw first tries to split it at the space or soft hyphen that gives the most characters that will fit in the column. If this is not possible, the text is split at the character that gives the longest line that just fits in the column.

Special characters and paragraph formatting

Certain characters have special interpretations:

- All control characters are ignored, except tabs, which are treated as spaces.
- Newline characters appearing before any printing text insert a paragraph spacing.

- A single newline character in the body of the text is treated as being equivalent to a space, unless it is preceded or followed by a space, in which case it is ignored.
- A sequence of n newline characters in the body of the text inserts n–1 paragraph spacings.

For columns other than the first, paragraph spacings at the head of the column are ignored. Lines which protrude vertically beyond the limits of the column are not displayed; however, all commands occurring in them are interpreted. This can occur if the line spacing is significantly smaller than the font height. You should take care (by using the \M command) to ensure that lines do not protrude beyond the limits of the column horizontally, since the text may not be displayed correctly in this case. The only circumstances in which this is likely to happen are when an italic font is used and the margin setting does not allow for it.

Font usage

When a text area is being constructed from a text file, or being loaded as part of a Draw file, checks are made on the fonts contained in it. If a font is not available, a warning message is displayed. Text that should be in this font will appear in the most recently used font. If no valid font has ever been seen, the text is not displayed.

Exporting text from a text area

Text used to construct a text area may be re-exported into a text file, by choosing **Text area** from the Save menu. This can be useful for altering text areas in a Draw file, when the original text file used to create them is no longer available.

Default text area header

If the text does not start with a version number line (\! 1), Draw will insert the following standard header:

```
\! 1
\F 0 Trinity.Medium 12
\F 1 Corpus.Medium 12
\0
\AD
\L12
```

This defines two font references, sets the text to be displayed in font 0 (Trinity Medium), justified to both left and right margins, with a line spacing of 12 points.

If you subsequently export the text, the standard header will be exported as well.

DXF files

Draw can read files in DXF (data interchange) format. This is a file format used by other graphics programs such as AutoSketch. Draw cannot save files in DXF format.

When you load a DXF file into Draw by dragging it into a window or onto the Draw icon, a dialogue box appears, in which you can specify:

- whether coordinates and sizes in the file are to be interpreted as being in inches or centimetres;
- a scaling unit to be applied to all coordinates and sizes;
- the name of the font in which text is to be plotted. If the name you give is blank, or is not the name of an outline font known to Draw, the text will be plotted in the system font.

To load the file, click on **OK**. If you click on **Abandon**, the file is not loaded.

The following restrictions apply to DXF files loaded into Draw:

- The following DXF object types are not implemented: SHAPE, ATTDEF, ATTRIB, 3DLINE, 3DFACE, DIMENSION.
- Line types are ignored: all lines are created as solid.
- Layers are not implemented.
- Text justification may be approximate in outline fonts.
- Straight line objects are drawn in a single width and colour.
- Colours are guessed from a set of standard values. Unknown colours are converted to black.
- Text may not be rotated or oblique. The text style table is not used. There is no backwards or upside-down plotting.
- A single font is used for all the text in the file.
- There is no curve fitting.
- Block INSERTs do not use column and row values, attribute entries, rotation, or z scaling.

Working with multiple Draw files

You can be working on several Draw files at the same time; simply click on the Draw icon on the icon bar to start up another Draw window.

It is easy to copy objects between Draw windows. Select the object you wish to move, move the pointer to the destination Draw window and choose **Copy** from the **Select** menu. The selected object is copied into the new window. Alternatively you can use the **Save** and **Save Selection** menu options to drag Draw icons into new Draw windows.

If you are working with multiple Draw windows, only one window can be selected at a time. So, if you select an object in one window and then select an object in another window, you will nullify the selection in the first window. Additionally clicking on the Draw icon to create another Draw window also nullifies any current selection.

Saving Draw features in a Desktop boot file

You may wish to change some aspects of the way new Draw windows appear. For example, a new window normally opens with the closed line tool selected, but you may prefer to have the Select tool ready to use each time you start Draw.

You can set features of this type by setting up Draw as you wish to use it, then save these features by creating a Desktop boot file. Instructions on how to create a Desktop boot file are given in the RISC OS 3 *User Guide* in the chapter *Desktop boot files*.

There are several features of Draw that you can set before saving a Desktop boot file, so that they are set up the way you want them each time you switch on. The Draw features that will be recorded when you go through this process are known as Draw$Options.

Saving display features

Any Draw features that you set before creating your boot file will be saved, so that the computer not only loads Draw, but sets the features you have chosen.

If you wish to set the Draw features, **without running Draw itself**, follow these steps:

1. Create a Desktop boot file following the instructions above and in the RISC OS 3 *User Guide*.
2. Load the resulting !Boot file into Edit by dragging it onto the Edit icon (not by double-clicking: this will run the !Boot file).

3 Search for the line which runs Draw: this will read something like

```
Run Resources:$.Apps.!Draw
```

4 Delete that line and resave the !Boot file.
(Leave the line starting

```
Set Draw$Options
```

unchanged.)

Customising the Desktop boot file

If you change some of Draw's default features and then create a Desktop boot file using the Task manager, you can load the file into Edit to examine it. You will find a line reading

```
Set Draw$Options "..."
```

where the string of letters and numbers between the double quotes corresponds to the features you have selected. If you have not changed any features, the `Set Draw$Options` line will appear in your boot file as

```
Set Draw$Options ""
```

Here are two examples of Draw$Options:

```
Set Draw$Options P4L T- MS
```

This selects a paper size of A4 in landscape format, turns the Toolbox off and chooses the select tool as default.

```
Set Draw$Options G1x10SL ML
```

This causes a 1 inch grid with 1/10 inch subdivisions to be displayed, with grid lock on, and the line tool selected as default.

If you do not specify an option in the command, it will be set to the default. Case is not significant, except for the values that can be given to the M option: L or l, and C or c (see the list below).

The table overleaf provides a reference for those who may wish to create their own boot file without using the Task manager, or who may wish to edit a boot file after creating it.

Letter	Feature controlled	Possible values	Meaning
P	Paper size and format	*n*	Paper size A*n* (eg A4)
		L	Landscape format (if not set, portrait is used)
		S	Show paper limits
G	Grid	*a*x*b*	*a* = spacing, *b* = subdivisions
		I	Isometric (rectangular if not set)
		A	Auto-adjust on
		S	Show grid
		L	Grid lock on
		C	cm units (inches if not set)
Z	Zoom	*a*:*b*	Set zoom to *a*:*b*
		L	Zoom lock on
T	Toolbox display	+ or –	Toolbox on or off
M	Tool/mode selected	One of:	
		L	Line
		l	Closed line
		C	Curve
		c	Closed curve
		R	Rectangle
		E	Ellipse
		T	Text
		S	Select

Default settings

The default settings used by Draw are as follows:

Setting	Meaning
P4	A4 portrait format, paper limits not shown
G1x4A	1 inch rectangular grid with 1/4 inch subdivisions, not shown or locked, auto-adjust on.
Z1:1	Zoom 1:1, zoom lock off.
T+	Toolbox on.
Ml	Closed line tool selected

Increasing the Undo buffer size

When you make a change to your diagram, such as deleting an object, Draw stores the previous state of the diagram in a buffer (area of memory) so that it can restore it if you use the **Undo** option. This buffer has, by default, a size of 5KB. Experienced users of RISC OS may wish to use the Command Line to increase the size of the buffer. To do this, enter the Command Line and type

```
Set Draw$Options Un
```

substituting for *n* the size you want, in bytes. To make the buffer this size each time you use Draw, edit the line that the Task manager will have created for you in your boot file (described in the section *Saving display features* on page 72), adding the `Un` immediately before the double quotes at the end of the line.

Keystroke equivalents

Many Draw operations can be carried out from the keyboard instead of the menus and mouse; when you are familiar with the application, you may find this more convenient.

Keystroke equivalents in Enter mode

Keystroke	Effect
F3	Save file (calls up the normal **Save as** dialogue box)
Shift-F3	Save selection
Ctrl-F3	Save sprites
Shift-Ctrl-F3	Save text area
F2	Load named file (calls up a dialogue box into which you can type the name of the file you want to load)
Shift-F2	Insert named file (calls up a dialogue box into which you can type the name of the file you want to insert into the Draw file you are working on)
Ctrl-F2	Close window
Print	Print file
F1	Toggles between show and hide grid

Keystroke	Effect
Shift-F1	Toggles **Lock to grid** on and off
Ctrl-F1	Switch Toolbox on or off
Ctrl-Q	Zoom out
Ctrl-W	Zoom in
Ctrl-D	Zoom to 1:1
Ctrl-R	Previous zoom
Ctrl-L	Zoom lock 2
F8	Undo
F9	Redo
F6	Enter Select mode
←, ↓, →, ←	Move pointer one pixel

Keystroke equivalents in Select mode

Keystroke	Effect
F7, Copy, or Ctrl-C	Copy selection
Shift-F8, Delete, or Ctrl-X	Delete selection
Shift-F6 or Ctrl-Z	Clear selection
F5 or Ctrl-A	Select all
Ctrl-F4 or Ctrl-F	Bring to front
Ctrl-Shift-F4 or Ctrl-B	Send to back
F4 or Ctrl-G	Group objects
Shift-F4 or Ctrl-U	Ungroup objects
Shift-F5 or Ctrl-S	Snap to grid
Ctrl-F6 or Ctrl-E	Enter Path edit mode
Ctrl-F5 or Ctrl-J	Justify

Keystroke equivalents for tool selection

Keystroke	Effect
Ctrl-F7 or Tab	Enter text
Ctrl-F9	Enter closed line
Ctrl-F8	Enter closed curve
Return	Complete path
Escape	Abandon

Keystroke equivalents in Path edit mode

Keystroke	Effect
Ctrl-F8	Change to curve
Ctrl-F9	Change to line
F7, Copy or Ctrl-C	Add point
Shift-F8, Delete or Ctrl-X	Delete segment
F5	Enter coordinate
Return	Finish path edit
Shift-F5 or Ctrl-S	Snap to grid

3 Paint

Paint is a pixel-based picture editor; you can use it to 'paint' coloured images by applying colours to an area with a variety of brushes and painting tools.

The pictures produced by Paint are kept in the form of **sprites**. A sprite is a graphic shape made up of an arrangement of pixels (the smallest unit the screen uses in its current mode). Sprites are stored in **sprite files**, which may contain more than one sprite. Sprites and sprite files use a standard format, so you can freely export images produced by Paint to other programs that use sprites (such as Draw and Acorn Desktop Publisher). You can also use Paint to edit sprites produced by other RISC OS applications.

The important difference between Paint and Draw is that unlike Draw, Paint knows nothing about 'objects' such as rectangles and circles; all it knows is the colour of each pixel. Although you can paint regular shapes, you cannot then select them in order to delete, move or resize them.

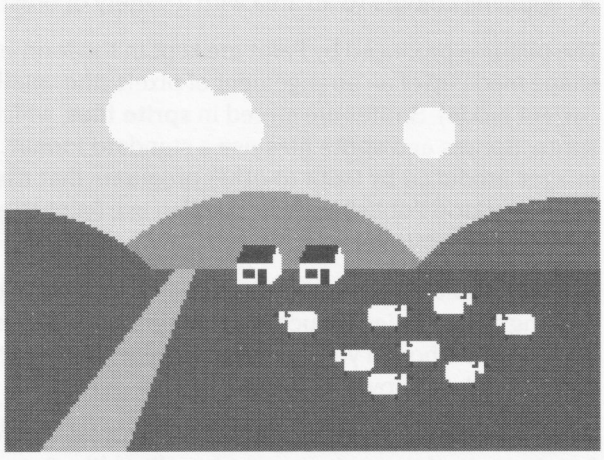
When you export a sprite from Paint into Draw, this remains true: regular shapes forming part of the sprite cannot be edited like Draw objects. The whole sprite becomes a single object in your Draw diagram, and can be moved or resized, but not otherwise edited.

The first part of this chapter is a tutorial section that introduces some of the more common features of Paint and shows how they can be used to create a simple sprite.

Later sections contain more detailed descriptions of all the features of Paint, backed up with examples demonstrating how each feature can be used.

Paint tutorial

This is a tutorial section that shows you how to use Paint to produce a simple picture (shown below). The tutorial is not designed to show you how to use all the Paint tools – in fact it only uses a few – but to give you a general idea of how the application works.



For the tutorial, you should use a 256-colour screen mode such as 15 (for a normal monitor) or 28 (for a high-resolution monitor). Use the Palette icon bar menu to set the mode.

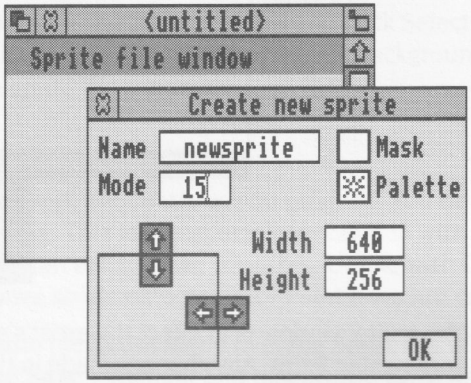
The landscape sprite is built from two types of component: the landscape itself, which you will create from scratch, and the sheep and house shapes which are themselves small sprites that we have provided for you. Towards the end of the tutorial you will learn how to superimpose these on your landscape.

Starting Paint

Open the Apps directory by clicking on the Apps icon on the icon bar. Start Paint by double-clicking on the Paint icon in the directory display. As with other RISC OS applications, Paint indicates it has been loaded by displaying its icon on the icon bar.

Creating a new sprite

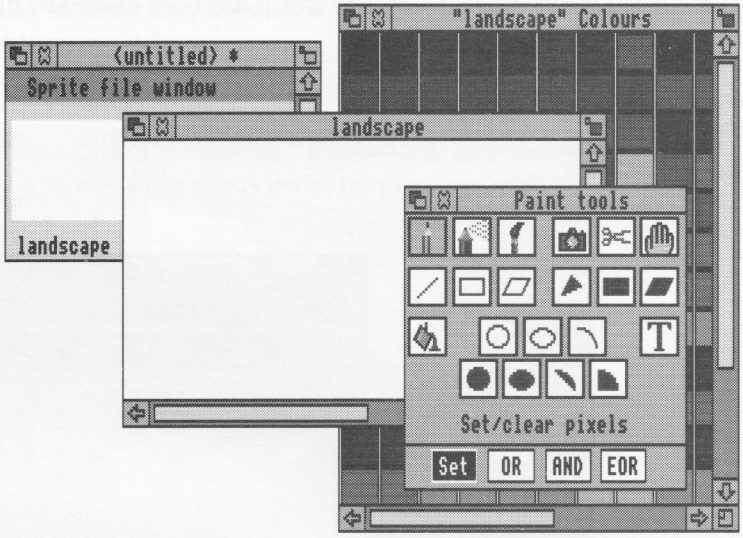
The first step in creating a new sprite is to click on the Paint icon on the icon bar. This displays the **Create new sprite** window with a **Sprite file window** behind it.



The Create new sprite window lets you type in the name you wish to give to your new sprite.

For this tutorial delete the existing name Newsprite (using the Delete key) and type in the name for our sprite, Landscape. Now change the size of the sprite to be created by clicking on the **Width** box and changing the value to be 400 and then clicking on the **Height** box and changing the value to be 150.

Click on the **OK** box and the (blank) sprite is created. The sprite window is displayed together with the **Colours** that you can paint with and the **Paint tools** you can use for painting.



The sprite window is in effect the artist's studio where changes can be made to the sprite using Paint. Any changes made in the sprite window are instantly reflected in the sprite file window.

You should now have four Paint windows on your screen: the sprite file window, the sprite window, the tools window and the colours window. In a 256-colour mode, the colours window is rather large, and you would need to scroll it to see the full range of colours. To display a smaller version, press Menu with the pointer on the sprite window, move to the **Paint** submenu, and click on **Small colours**. The small colours window fits on the screen better, but has the disadvantage that when you select a colour, you cannot see its number. However, for the tutorial, it mostly won't matter exactly which colours you use.

Drag the windows around the screen so that you can see all of them at once.

Zooming in and out

You will be able to see what you are doing more easily if you double the size of the sprite window. Press Menu on the sprite window, and move to the **Zoom** dialogue box. This is the standard magnifier dialogue box, described in the chapter entitled *Introducing the Applications Suite* on page ix. Click on the up arrow on the left to create a magnification of 2:1.

Creating a blue background

To create a blue background which will become the sky, follow these steps:

1 Firstly, make the sprite full size by clicking on the Toggle size icon in the top right hand corner of the window.

2 Click over a suitable sky-blue coloured square in the colours window. The colour square is highlighted when it is selected (if you use the large colours window, the colour's number will appear in the square as well).

3 Click over the **Replace colour** icon in the Paint tools window. The tool indicates it has been selected by the icon being highlighted and the name of the tool appearing in the box at the bottom of the menu.

4 Position the pointer in the sprite window and click Select. The entire window will be filled with the selected colour. This new background colour will also be displayed in the sprite file window.

Saving your work

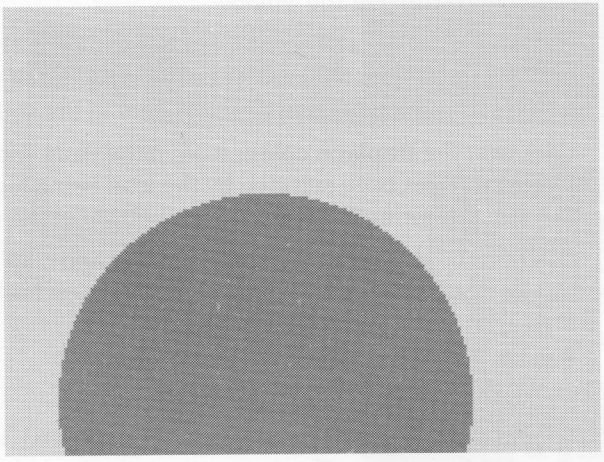
You should save your work frequently as you proceed. You can then return to the last step if you go wrong. This is an especially good idea with Paint, since with some of the tools you can easily make mistakes. Unlike with Draw, you cannot undo your work or move single objects, since Paint does not create objects as such.

To save the whole sprite file, press Menu over the Sprite file window (not the Sprite window). Move to the **Save** submenu and display the **Save as** dialogue box. As with any other application, you should delete the default name that appears and drag the icon to the directory where you want to save the file. For this tutorial, use the name Pictures. The name of the sprite file now appears in the Title bar of the sprite file window.

Creating the landscape

The landscape is made up out of several regular shapes painted partially overlapping one another. The distant hills are painted first. Choose a light grey colour and the **Filled circles** tool. Move the pointer back over the sprite window. Click once near the bottom of the window, a little to the left of centre. This defines

the centre of the circle. Move the pointer upwards; as you do so, a circle shape tracks the position of the mouse. When the circle is the size you want, click Select again. Aim for a circle looking more or less like this:

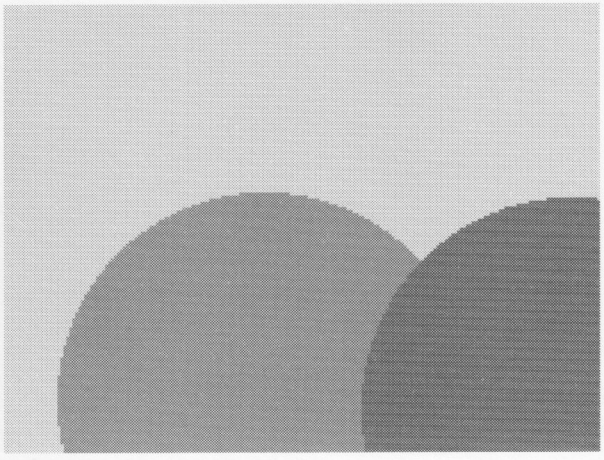


If you realise you have positioned the centre in the wrong place **before** you click a second time, you can make a fresh start by returning the pointer to the Tools window and clicking on the Filled circle icon again. This clears what you have already done.

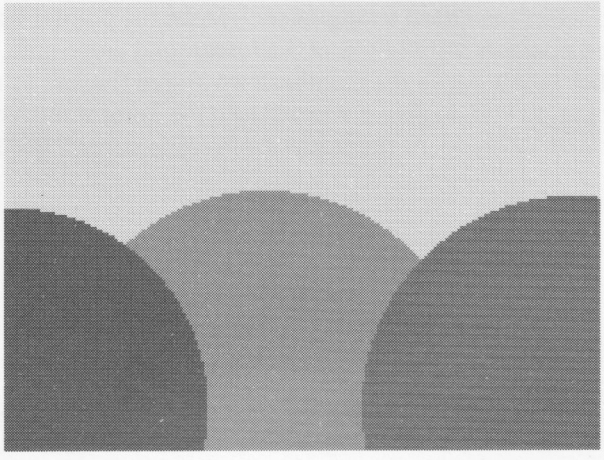
If you don't like your circle once you have finished it, you can remove it by selecting your original sky blue and the **Replace colour** tool again, and clicking in the circle. This will fill the circle with sky blue, effectively erasing it.

Once you are satisfied, save your work again before you go on.

Now choose a bluish-green colour and paint another circle with the centre near the bottom righthand corner of the sprite, and the edge roughly in line with the grey circle:

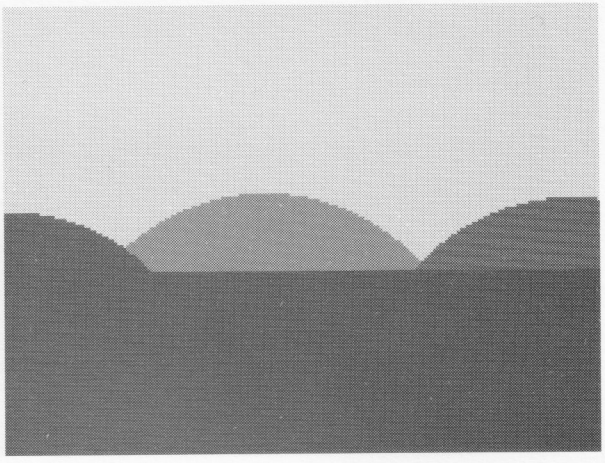


Select a more yellowish green and draw a third circle with its centre near the bottom lefthand corner of the sprite:



Keeping the same colour selected – choose the **Filled rectangles** tool. Place the pointer at the very lefthand edge of the sprite, about halfway down. Click Select. Move the pointer downwards and rightwards to the bottom righthand corner; just move the pointer – there is no need to use a drag. Position the point of the arrow

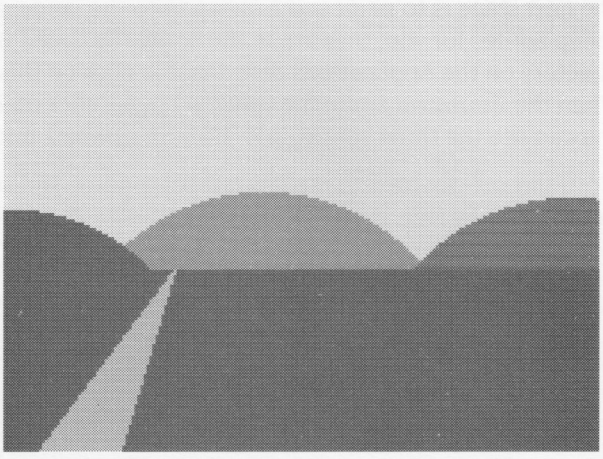
carefully **within** the sprite window, or nothing will happen. Click again. Paint will create a rectangle, which will merge in to the last circle you painted, being the same colour:



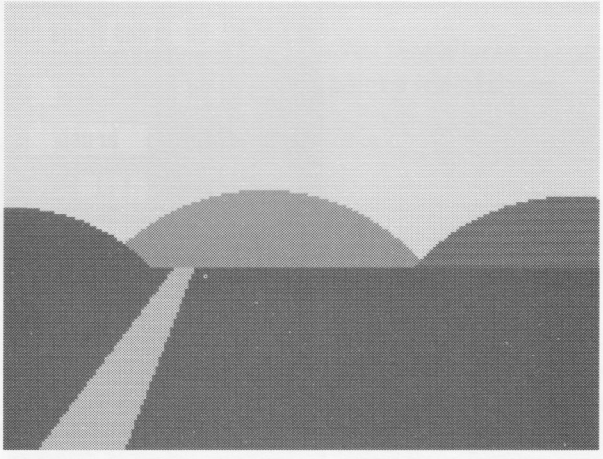
Save your work again at this point.

Now paint the road. Select one of the buff colours in the bottom row of the colours window. To obtain a perspective effect, the road is painted with two filled triangles, so select the **Filled triangles** tool. Move the pointer back onto the sprite window and position it at the top of the foreground green area, just to the right of the hill. Click Select. Move the pointer down and to the left, as far as the bottom of the sprite; as you do this, a line will join the point where you clicked with the current pointer position. At the very bottom of the sprite, click Select again, then move the pointer rightwards and click again.

You should have a triangle like this:



Create a second triangle alongside the first, with its apex meeting the bottom righthand corner of the first triangle. The two triangles should merge to form the road, narrowing into the distance:



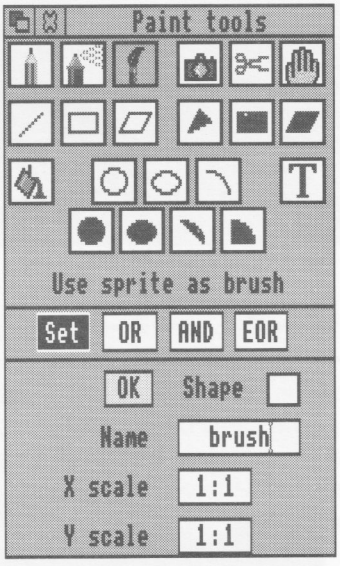
You may find that the triangles have not quite joined up as you intended. You can tidy up using the **Set/clear pixels** tool at the top left of the Tools window. Zoom in on the picture so that you can position the pointer accurately, and look for the places where your road shape needs touching up. Click Select to paint individual pixels in the road colour.

This is another good point to save your work before going on.

Using the sheep and house sprites

The next stage is to paint some sheep onto the landscape. We have created two sheep sprites for you: they are in the sprite file called `Brushes` in the **Tutorials** directory on the Applications disc. Double-click on this file to load it into Paint. When the `Brushes` sprite file window opens, click on its Toggle size icon so that you can see the three sprites in it: `house`, `sheep1` and `sheep2`.

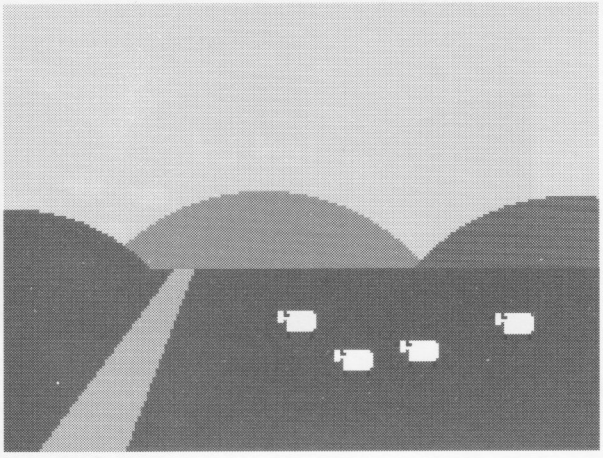
Move the pointer back to the Paint tools window and select the **Use sprite as brush** tool (the icon shaped like a paint brush). The tools window will now look like this:



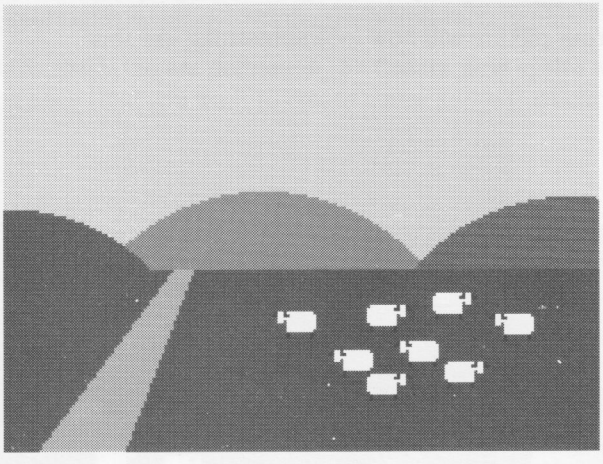
Some of this extended window may be below the bottom edge of your screen; if necessary, drag it upwards so that you can see all of it. The red caret will be in the **Name** box, after the word `brush`. Erase this word and type `sheep1` in its place. Now click on the starred **Shape** box to deselect it and finally click on **OK**. Provided the sprite file containing the sprite named sheep1 is open (and it is, because you have just opened it), it will be loaded so that you can use it in your landscape picture.

The **Shape** option when selected allows the shape of a sprite to be used as a brush; it is used as a filled shape with its colour taken from the Colours box. With the shape option deselected, the sprite is placed with its form and colours intact.

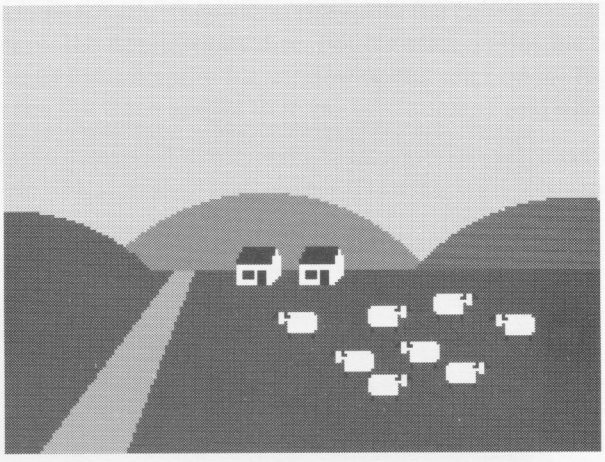
Move the pointer back over the sprite window. A sheep in various exotic colours (depending on where the pointer is) will follow your pointer around the screen. Click Select to paint a sheep. Paint a few to the right of the road:



`Sheep2` is the same as `sheep1`, except that it faces the other way. Go through the same process to use `sheep2`, and paint a few of those:



Use the house sprite to paint a house, or several houses.



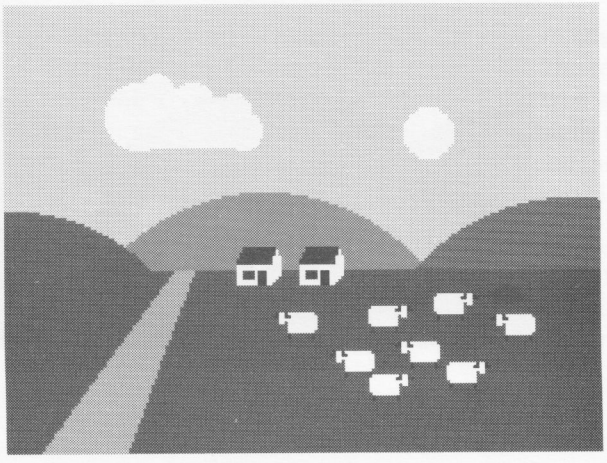
Paint the clouds and the sun

Since white clouds often have a rather flat base, begin by selecting the **Filled rectangles** tool along with the colour white (at the bottom righthand corner of the colours window). Draw a small rectangle towards the left of the sky.

Switch to the **Filled circles** tool and build up the cloud using small circles of varying sizes.

Create the sun by selecting a nice bright yellow and the **Filled circles** tool.

Your picture will now look something like this:



You have now completed the Paint tutorial. The rest of the chapter is a reference section describing the basic elements of Paint, the tools in detail, and how to customise Paint so that it always starts up the way you prefer it.

Reference section

This section outlines some of the terms, concepts and basic techniques for creating and editing sprites in Paint.

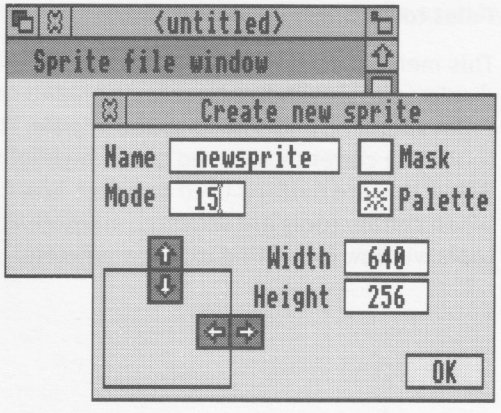
Sprites

Sprites have the following attributes:

- A name used to identify the sprite (sprite names are 1 to 12 characters long).
- A definition mode indicating the screen mode that was set when the sprite was defined.
- A height and a width (these are given in pixels); the default is the size of the current screen mode.
- A palette defining the colours used in the sprite (optional).
- Optionally, a mask (sometimes called a transparency mask).

Within the sprite, each pixel has a colour, chosen either from the sprite's palette, if it has one, or the palette for the screen mode it was defined in. If the sprite has a mask, you can use a special value in place of a colour, which indicates the pixel is transparent. When a sprite is painted, the existing screen display shows through the transparent pixels. By setting transparent pixels on the border of a sprite, you can construct sprites which are effectively non-rectangular.

All of these attributes are defined in the **Create new sprite** window, which is displayed each time you want to create a new sprite (just click on the Paint icon).



Paint windows

Paint has several windows with specialised functions:

Sprite file windows

The sprite file window shows all the sprites which are defined in the file you are working on. If you prefer, you can keep just one sprite in each sprite file, though if you are designing sprites for an application you will need to keep them together. Try looking at the sprite file for the Paint application itself: hold down Shift while double-clicking on the Paint icon in the Apps directory; this will open the application directory. Double-click on the Sprites file to load it into Paint. Scroll through the sprite file window to see the range of sprites used by Paint.

The sprite file window shows the sprites at actual size if possible, or in a scaled-down form if they are large. You can edit more than one sprite file at a time; each has its own sprite file window.

Sprite windows

Sprite windows are used for creating and editing the sprites themselves. You can have any number of sprite windows on the screen, or none. Each window contains one sprite. Open a sprite window for a sprite by double-clicking on its name in the sprite file window.

Sprite colours windows

Sprite colours windows are used for choosing the colour that you are painting with. There is a separate sprite colours window for each sprite, because different sprites may have a different range of colours available.

To open the colours window for a sprite, press Menu on the sprite window, go to the **Paint** submenu and select **Show colours**.

Paint tools window

This menu is used to select and alter the tools you use for painting the picture; display a Tools window by pressing Menu on the sprite window, moving to the **Paint** submenu and selecting **Show tools**. The top section of the window shows the tools. The currently selected one is highlighted and the name of the tool is shown. Below this are buttons used to select how colour will be applied to the image. When certain tools are selected, an extension may appear at the bottom of the tools window for setting extra parameters.

Basic techniques

To edit an existing sprite

To edit an existing sprite, follow these steps:

1. Load a sprite file into Paint by double-clicking on its icon.
2. Open a sprite window for the sprite you want to edit by double-clicking on its image in the sprite file window.
3. Modify the sprite by selecting tools and colours and using them in the sprite window.
4. Save the modified sprite file.

To create a new sprite

Open a Create new sprite window by clicking on the Paint icon on the icon bar.

1. Enter a name for the sprite, and values for its other characteristics (full details of these are given later).
2. Click on **OK**. The new sprite window and its associated sprite file window will open.

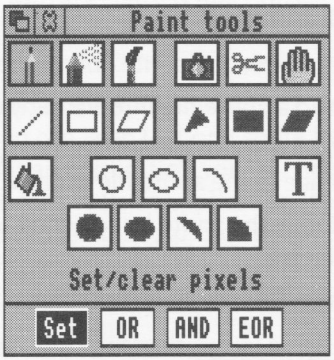
The tools in detail

Using tools

To use a tool to edit a sprite:

1. Click Select on the tool in the Paint tools window.
2. If you wish, set or change any parameters such as the size of the spray or brush to be used.
3. If necessary, change the colour of the 'paint' to be used by clicking on the new colour in the Sprite colours window.

4 Move the mouse to the sprite window, and apply the tool as described below.



There are four different ways in which the tool can apply colour to the sprite, chosen with the **Set**, **OR**, **AND** and **EOR** buttons. The descriptions that follow are given in terms of 'Set'. In this case, the colour applied by the tool replaces the colour which is already present. The four ways of using colours are described in the section entitled *Using colours in Paint* on page 102. The section entitled *Sprite colours window* on page 110 shows you how to choose an Extended Colour Fill for your colour pattern.

For operations such as drawing lines and rectangles, you can click Adjust instead of Select. This moves the nearest previously set point to the current position. For example, in the parallelogram operation described on page 99, clicking Adjust instead of Select at step 3 returns you to step 2, with the first corner taken from the location at which you clicked Adjust.

While some operations are in progress, a skeleton line or area is shown.

You can cancel any of the sequences of operations described below by clicking again on the current tool in the Paint tools window.

Set/clear pixels

To set a single pixel to the current colour, click Select over the pixel. To set several pixels, press Select and drag the mouse over the pixels. If you move the mouse slowly, a line will be created, but if you move it faster, the line will be broken. You can use this for shading areas of the picture. If you want to draw lines use one of the other tools instead.

If you use Adjust instead of Select, the pixels are cleared to the first colour in the palette.

Spray can

To 'spray' pixels in an area around the mouse position to the current colour, press Select over the centre of the area. As with Set/Clear pixels, you can drag the mouse as you spray onto the sprite.

If you use Adjust instead of Select, the pixels are cleared to the first colour in the palette.

Parameters:

The spray can has two parameters displayed at the foot of the Paint tools window, which you set by typing in the value you want:

- **Density** controls how many pixels are set or cleared in each spray operation. The higher the density, the more pixels are affected.
- **Radius** controls how far the spray extends from the mouse position.

Use sprite as a brush

This tool takes a sprite (not the one you are working on) and makes it into a 'brush'. Four simple brush shapes are provided:

- A square.
- A triangle.
- A circle.
- A brush.

Type in one of these options in the writable box and click on **OK** to select this simple brush shape.

However, you are more likely to want to use a sprite of your own to paint with. These could be single objects placed with a single click, like the sheep and house used in the tutorial, or patterns that you can drag over an area. Normally, you will want to give the brush sprite a transparent mask so that the shape does not appear with an unwanted surround.

There are two ways of using a sprite as a brush.

With the **Shape** option selected, you can use the sprite as a brush shape; the brush takes on the outline of the sprite. The brush paints in whatever colour you have selected.

With the **Shape** option deselected, you can use the brush to put a sprite into another sprite. The brush paints the sprite in its entirety.

The example below can be created as follows:

1 Open a new sprite file and create a sprite, 300 pixels wide by 200 high, with the name `demo`.

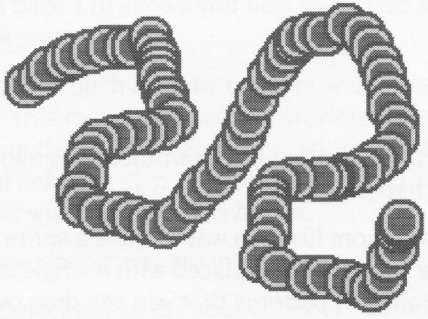
2 In the same sprite file, create a second sprite, with a mask and the name `blob`. Paint it using the filled circles tool, with a red circle first, a yellow circle inside it, and a green circle inside that. Fill the background (with the **Global** option set) with the transparent colour.

3 Open a sprite window for `demo`.

4 In the tools window, select the **Use sprite as brush** tool. Delete the default name `brush`, type the name `blob`, and click on **OK**.

5 Move the pointer back over the sprite window for `demo`. Enlarge it to full size and make it larger using the **Zoom** option if you wish. Starting near the top left, drag a squiggly line across the window. Notice how the sprite outlines merge into a single brush stroke.

6 Now to see the difference, try it again with the Shape option deselected. Notice how this time you plot a series of unconnected sprites.



Parameters:

The toolbox displays a box in which you can set four features:

- **Shape** determines whether just the mask of the sprite is used, or its colours as well. To change the parameter, click on the button. When **Shape** is set, brush fills the pixels in the brush sprite which are not transparent with the current colour. When **Shape** is not set, the brush paints with the coloured sprite image. By default Shape is set.

- **Name** of the sprite to be used for the brush. Enter the name of any sprite within an open sprite file window.
- **X scale, Y scale:** multipliers defining the actual size of the area painted by the brush relative to the size of the sprite. For example, a scale factor of 2:1 means the brush is twice the size of the sprite defining it, and 2:3 means two-thirds the size. Each scale factor consists of two numbers which may be set independently. This can be particularly useful when you want to use the same shape several times in a picture, but not always at the same size.

When you have entered the values you want, click on **OK**.

Copy block

To copy a rectangular block of pixels from one part of a sprite to another:

1 Select **Local** from the new panel that appears at the foot of the Tools window when you select **Copy**.

2 Position the pointer on one corner of the block to be copied.

3 Press Select, drag the mouse to the other corner of the block and release Select.

4 Move the pointer to the destination for the block and click Select.

Step 4 may be repeated to make multiple copies of the selected block. To finish copying, click the **Copy block** icon in the tools window again. Note that the box you mark is actually rounded outwards to the nearest block of pixels that encloses the box.

Copy block can also be used to create a new sprite from a block of an existing sprite. The new sprite can be set up in one of the sprite files you are already editing in Paint, or it can be saved in an entirely new sprite file, either to disc or for importing into another file or application.

To perform either of these operations, first click on the **Export** box in the Tools window. Then follow steps 2 and 3 as above to mark the block. When you release the mouse, a Save dialogue box for the block appears. To save the block as a new sprite in a sprite file, enter a name for the sprite, and drag the icon to a Paint sprite file window.

Move block

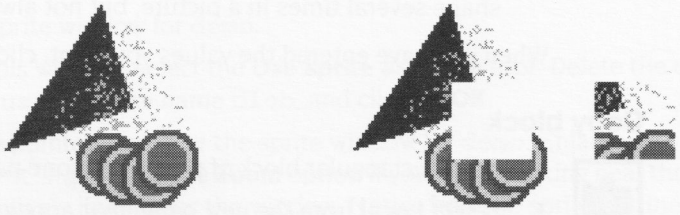
To move a rectangular block of pixels from one part of a sprite to another:

1 Position the pointer on one corner of the block to be moved.

2 Press Select, drag the mouse to the other corner of the block to be moved, and release Select.

3 Move the pointer to the destination for the block and click Select.

The area occupied by the source of the move is set to the first colour defined in the palette, so in a 16-colour mode, it will be left as a white rectangle, as in the following example, where a block in the righthand picture has been moved:



As for **Copy block**, the box you mark is actually rounded outwards to the nearest block of pixels that encloses the box.

Move block can be used to export a block of pixels using **Export**. This is identical in use to **Copy block**.

Move whole sprite

To move the entire sprite, press Select within the sprite window, drag the mouse to the new position and release Select. The parts of the sprite image that move outside the limits of the sprite are permanently lost.

Lines

To create a solid line of pixels in the current colour:

1 Click Select at the start point of the line.

2 Move the mouse to the end point of the line.

3 Click Select.

Rectangle outlines

To create a rectangular outline in the current colour:

1 Click Select at one corner of the rectangle.

2 Move the mouse to the other corner and click Select.

Parallelogram outlines

To create a parallelogram outline in the current colour:

1 Click Select at one corner of the parallelogram.
2 Move the mouse to the next corner.
3 Click Select.
4 Move the mouse to the third corner.
5 Click Select.

The position of the fourth corner is derived from the other three.

Filled triangles

To create a filled triangle in the current colour:

1 Click Select at one corner of the triangle.
2 Move the mouse to the second corner.
3 Click Select.
4 Move the mouse to the third corner of the triangle.
5 Click Select.

Filled rectangles

Filled rectangles are created in the same way as outline rectangles.

Filled parallelograms

Filled parallelograms are created in the same way as outline parallelograms.

Replace colour

To replace one colour by another in a sprite (also called **flood fill**):

1 Select the new colour from the sprite colours window (see below for how to display this if it is not already on the screen).
2 Click Select in the area of the sprite to be changed.

Colours can be changed locally or globally. In a local change, the pixels that are changed are the ones you click on, and any others which are connected to it by pixels of the same colour. In a global change, all pixels in the sprite which have the same colour as the one you click on are changed.

To select local or global changes, click Select on the corresponding button in the tools window. The current option is highlighted.

Note that replacing transparent pixels with a colour or a colour with transparent pixels can only be done globally. Global replace colour can take a long time.

Circle outlines

To create a circle outline:

1. Click Select where you wish to place the centre of the circle.
2. Move the mouse until the circle has the required radius.
3. Click Select.

Ellipse outlines

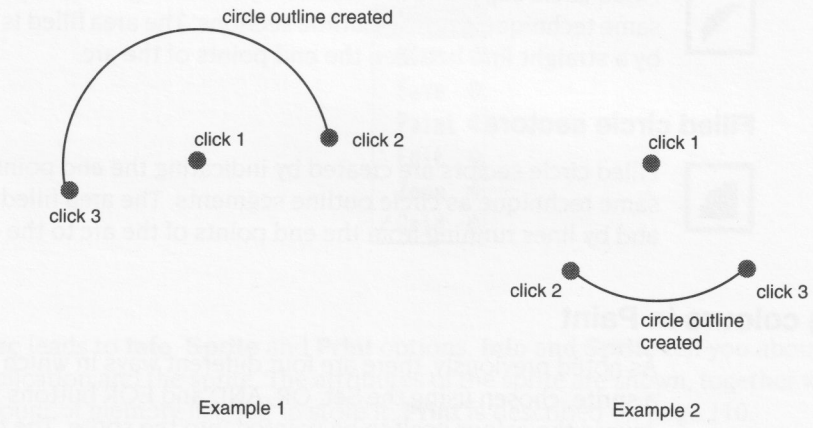
To create an ellipse outline:

1. Click Select where you wish to place the centre of the ellipse.
2. Move the mouse to indicate the width of the ellipse.
3. Click Select.
4. Move the mouse until the ellipse has the required size and orientation.
5. Click Select.

Circle section outlines

To create a section consisting of a circular arc:

1. Click Select where you wish to place the centre of the arc.
2. Move the mouse to one end point of the arc.
3. Click Select.
4. Move the mouse to where you wish the arc to finish.
5. Click Select.



Insert text

To insert text into the sprite, first select the text tool. The tools window extends to include boxes where you should type in the following:

- The text, in the box containing the caret. The text will scroll in the box if it is too wide to be displayed all at once.
- X and Y character sizes
- Character spacing.

After you have typed in your text, click Select in the sprite window at the position where the centre of the text is to be positioned.

The sizes and spacing are measured in pixels and the text is drawn in the current colour. Only the System font is available in Paint, but if you want to use another font, save the sprite into Draw, superimpose text in the font required, and then take a 'snapshot'.

Filled circles

Filled circles are created in the same way as outline circles.

Filled ellipses

Filled ellipses are created in the same way as outline ellipses.

Filled circle segments

Filled circle segments are created by indicating the end points of an arc, using the same technique as circle outline sections. The area filled is bounded by the arc and by a straight line between the end points of the arc.

Filled circle sectors

Filled circle sectors are created by indicating the end points of an arc, using the same technique as circle outline segments. The area filled is bounded by the arc and by lines running from the end points of the arc to the centre of the circle.

Using colours in Paint

As noted previously, there are four different ways in which you can apply colour to a sprite, chosen using the Set, OR, AND and EOR buttons in the tools window. Set causes the colour itself to be painted into the sprite. The remaining three styles cause the indicated logical operation to be applied between the colour number of the pixel on the screen and the colour number selected from the sprite colours window. (The colour number appears in the colours window when the colour is selected.)

For example, if EOR is selected, spraying with colour 11 (binary 1011) onto an area that is currently colour 12 (binary 1100) will produce pixels in colour 7 (binary 0111). For a description of the logical operations, see the BBC BASIC *Reference Manual*.

You should notice that applying colour to a sprite using OR will tend to set more pixels towards the higher numbered colours in the palette. If AND is used then more pixels will be set to the lower numbered colours in the palette. Painting with EOR tends to maintain a wider variety of colours than either of the previous two styles.

A sprite's palette can be set by dropping a palette file onto the sprite window.

The most interesting effects are achieved when spraying over a range of existing colours, or drawing overlapping filled shapes. Experiment for yourself!

Sprite windows and menus

Each sprite window contains a single sprite. All individual sprite editing actions are carried out in the sprite window. You can have more than one window open for a particular sprite. This enables you to set different magnifications, display a grid in one window but not others, scroll to different parts of the sprite, and so on. Changes made in one window are reflected in the others.

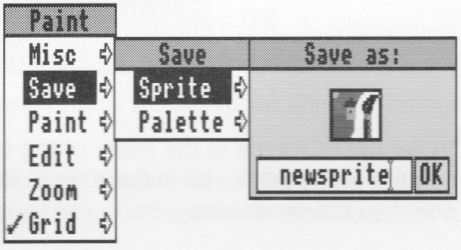
There is a menu associated with sprite windows. Click Menu over a window to obtain it. The menu entries are as follows:

Misc

Misc leads to **Info**, **Sprite** and **Print** options. **Info** and **Sprite** tell you about the application and the sprite. The attributes of the sprite are shown, together with the amount of memory needed to store it. **Print** is described on page 110.

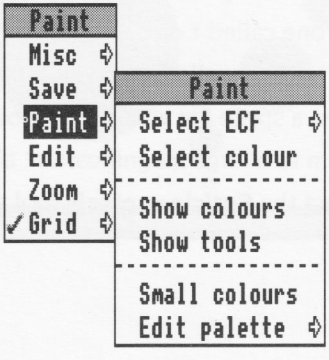
Save

Save leads to a submenu from which you can save the sprite and the sprite palette.



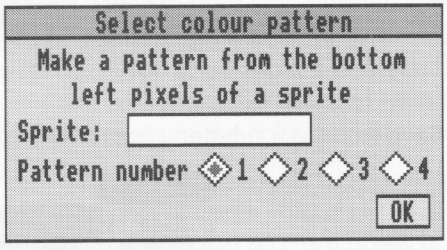
Paint

Paint leads to a submenu used for controlling the available editing facilities. It has the following entries:



Select ECF leads to a dialogue box which you can use to extract the bottom lefthand pixels of a named sprite as an Extended Colour Fill (ECF) pattern. Up to four such patterns may be defined. ECFs consist of patterns that may be used in place of a colour, and will be added to the sprite palette, below the plain colours.

The ECF is taken from a rectangle 8 pixels tall, in the bottom left of the named sprite. The width of the rectangle depends on the number of colours in the sprite the pointer was over when you clicked Menu: 8 pixels wide for 2-colour modes, 4 wide for 4-colour modes, 2 wide for 16-colour modes and 1 wide for 256-colour modes. Extended colour fills are useful for painting large areas in striped, chequerboard or stippled patterns. However, one consequence of the differences in ECF between modes is that you can obtain stippled or chequered patterns for modes with up to 16 colours, but for 256-colour modes, only stripes are possible. You can define up to four ECFs for each sprite.



To set the ECF, type in the name of the sprite it is to be taken from, click on the number of the ECF to be defined, and click on **OK**. To use the ECF in editing, select it in the colours window.

Create and use an example ECF following these steps:

1 Choose a 16-colour mode such as 12 or 20.

2 Open a sprite file window.

3 Create two sprites within it:

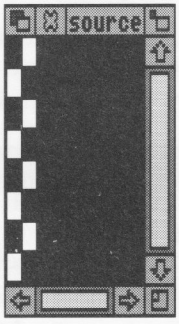
- one called `test`, 300 pixels wide by 200 high.
- another called `source`, 2 pixels wide by 8 high.

4 Open a sprite file window for `source`.

5 Zoom to a large magnification: about 10:1.

6 Select the **Set/clear pixels** tool and a colour of your choice (not white!).

7 Click on alternate pixels in the sprite window to create a chequerboard pattern:



8 Close the `source` sprite window.

9 Open the `test` sprite window, and zoom down again to 1:1. Use the Toggle size icon to enlarge the window to its full size.

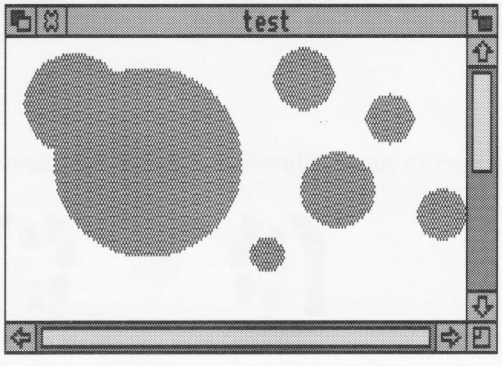
10 Press Menu and move to the **Paint** menu, then to the **Select ECF** dialogue box.

11 Type `source` in the box, and click on **OK**.

12 Select a filled shape tool such as **Filled circles**.

13 Enlarge the colours window for the sprite: the ECF colour will be at the bottom. Select it.

14 Paint circle shapes in the normal way: they will be filled with the chequerboard pattern you designed in `source`, and the result will look something like this:



Select colour: Choosing this sets the colour for future tool window operations to the colour of the pixel the pointer was over when Menu was pressed. It can be used to find out exactly which colour has been used at a point in a sprite.

For example, with the colours window open, position the pointer over the area of the sprite you are interested in and choose **Select colour** from the menu. The entry in the colours window will show the colour.

Show colours displays the sprite colours window, if it is not already on the screen. If the colours window is already open, but is hidden, it is brought to the front of the screen.

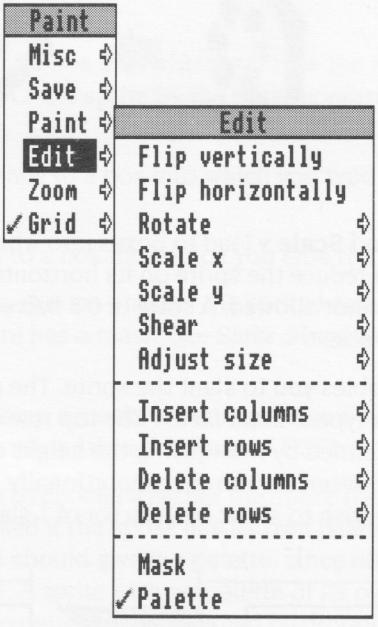
Show tools displays the tools window if it is not already on the screen. If the tools window is already open, it is brought to the front of the screen.

Small colours toggles the size of the sprite colours window; the colours window must be open. The small colours window takes less screen space than the large one. This is particularly valuable in 256-colour modes. The menu option is ticked when the small colours window is in use.

Edit palette is only available for sprites with 16 or fewer colours that have their own palette. The menu option leads to a colour dialogue box which you can use to change the sprite palette. See the section entitled *Shared features in the Applications Suite* on page xvii at the beginning of this guide for a description of how to choose colours. The colour you choose is transferred to the currently selected entry in the palette. To give a sprite its own palette, click on **Palette** in the Edit menu (described overleaf).

Edit

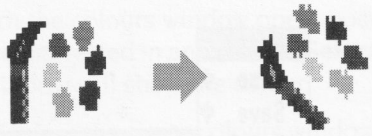
Edit leads to a submenu used for miscellaneous editing actions on the sprite. It has the following entries:



Flip vertically inverts the sprite vertically about its centre:

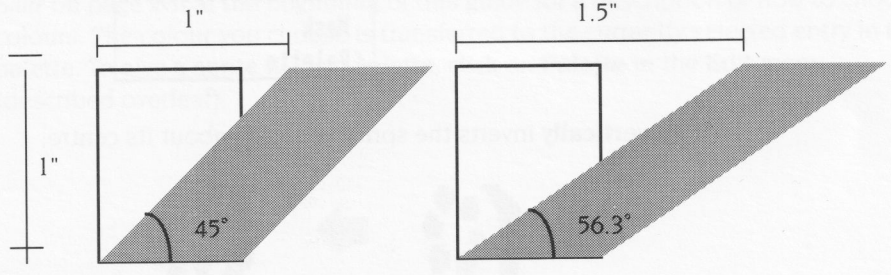
Flip horizontally inverts the sprite horizontally about its centre:

Rotate leads to a box into which you type the rotation angle (expressed in degrees anticlockwise). The sprite size changes if you rotate for angles other than multiples of 90 degrees.



Scale x and **Scale y** lead to boxes into which you type a multiplication factor to enlarge or reduce the sprite on its horizontal or vertical dimension. Negative scale factors are not allowed. A scale of 0.5 halves the sprite size. A scale of two doubles the sprite size.

Shear enables you to slant the sprite. The option leads to a dialogue box into which you type a shear factor. The top row of pixels is moved rightwards by an amount defined by multiplying the height of the sprite by the factor given. The rows in between are moved proportionally. The factor is, in fact, the tangent of the angle you wish to shear by. A factor of 1 slants the sprite 45°.



Shear factor = 1
Angle = 45°

Shear factor = 1.5
Angle = 56.3°

Adjust size leads to a dialogue box which you can use to alter the height and width of the sprite. The values are changed either by typing in new values, or by using the boxes marked with arrows to alter the values. When you have set the size you want, click on **OK**. The arrows allow you to add and delete rows and columns from the top and right sides of the sprite.

Insert columns leads to a box into which you type the number of columns to insert. This extends the width of a sprite by the number of columns specified, filled with the background colour.

This operation and the next three apply at the position the pointer was over when you pressed Menu. This will be shown as a box on the sprite. By moving the pointer into the sprite window (without passing over a menu) you can change the size of the box. The menu option shows the current size of the box; click Select to use the current size.

Insert rows leads to a box into which you type the number of rows to insert. This extends the height of the sprite by the number of rows specified, filled with the background colour.

Delete columns leads to a box into which you type the number of columns to delete.

Delete rows leads to a box into which you type the number of rows to delete.

Mask allows you to choose whether the sprite has a mask or not. The menu option is ticked if the sprite has a mask. See *Sprite colours window*, overleaf, for more about masks.

Note that if you assign a mask for your sprite you can only define three ECF patterns, since the mask takes the place of ECF3.

Palette allows you to choose whether the sprite has its own palette or not. The menu option is ticked if the sprite has its own palette. If you intend to export a sprite to Draw, you should give it a palette, since otherwise it will not retain the colours you gave it. A sprite with no palette of its own uses the current desktop palette. A Sprite's palette can be changed by dropping a palette file icon onto the window displaying the sprite.

Zoom

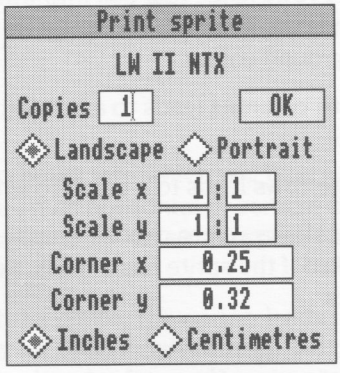
Zoom leads to a magnifier dialogue box which you can use to change the size at which the sprite is displayed. See the chapter entitled *Introducing the Applications Suite* on page ix at the beginning of this guide for a description of how to use the magnifier dialogue box. Note that the magnification only changes the size at which the sprite is displayed in the window; the actual definition, height and width are not affected.

Grid

Grid leads to a submenu of colours. Choose one to display a grid in that colour in the sprite window. The grid shows where the pixel boundaries are; it can be useful for lining up parts of the sprite. If you choose **Grid** directly from the menu (ie without moving to the colour submenu), the grid is turned on or off. The grid is not shown if the displayed size of the sprite is too small (magnification of less than 4:1).

Print

Print, chosen from the **Misc** submenu, leads to a dialogue box which you can use to print the sprite. The exact contents of the dialogue box depends on the printer driver in use, but it typically allows you to choose the orientation (**Portrait** or **Landscape**), scaling, and position on the paper.



The **Scale** option allows you to change the proportions of the printed image. Setting both x and y to 1:2 will produce a half-sized image.

The **Corner** option defines where on the printed page the image will be printed. The default settings define the edge of the printable page for your printer. Changing these settings will move the printing position of the image.

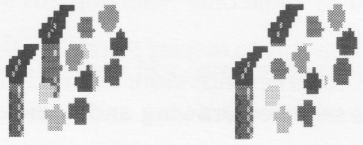
Sprite colours window

The sprite colours window is used to select the current colour for the editing you are doing. The current colour is highlighted, and shows the colour number. The colours shown are the shades that can be displayed in the current screen mode. These may be an approximation to the actual palette of the sprite.

If you have defined any Extended Colour Fill (ECF) patterns for the sprite, they are also shown in the sprite colours window, below the other colours. You may need to enlarge the colours window in order to see them.

If the sprite has a mask, an extra, special colour is shown in the bottom lefthand corner of the sprite colours window, as a grey or shaded square. You can use this colour – in the same way as any other colour – for making pixels transparent; this can be useful if, for example, you wish to design a sprite so that if it is displayed on top of something else, the background can be seen. The pictures below show two

Paint icons on top of one another. On the left, the top sprite has a transparent background, and on the right, it has a white background. Notice how you can see the handle of the paintbrush in the lefthand pair, but not in the pair on the right.



If you close the last window open on a sprite, the corresponding sprite colours window closes as well. However, the sprite colours window can be closed without closing the sprite window.

Sprite file windows and menus

The sprite file window shows all the sprites defined in the file. The sprites in this window are updated as you edit them in a sprite window. You can have more than one sprite file window open at a time. If you close a sprite file window, all the sprite windows that are currently open will close.

To open a sprite window for a sprite, double-click on it in the sprite file window.

There is a menu associated with sprite file windows. Click Menu over the window to obtain it. The menu entries are as follows:

Misc

Misc displays information about the sprite file and the application.

Display

Display leads to a submenu which allows you to select how sprites are shown:

Drawing and name: choose this to display a sprite in the sprite file window as the sprite and its name only. Selecting this switches **Full info** off.

Full info: choose this to display a sprite in the sprite file window as the sprite and its name, together with more detailed information about the sprite. Selecting this switches **Drawing and name** off.

Use desktop colours: choose this to toggle whether the desktop colours, or the BBC microcomputer-compatible set of standard default colours for the sprite mode are used in displaying sprites. Using the desktop colours will show you how the sprite would appear if used as an icon. This option is ignored if the sprite has its own palette.

Save

Save leads to a Save dialogue box for saving the sprite file.

Sprite

Sprite '**pic**' leads to a submenu of actions applying to an individual sprite. This is only available if the pointer were over a sprite when you clicked Menu. The submenu contains the following options:

Copy leads to a box where you should type in a new name and press Return to make an exact copy of the sprite under the pointer with the given name. The copy will appear in the sprite file window.

Rename leads to a box where you should type in a new name and press Return to change the name of the sprite.

Delete deletes the selected sprite from the Sprite file window.

Save leads to a standard Save dialogue box for saving an individual sprite.

Info displays a box containing information about the sprite.

Print leads to the same dialogue box as is reached via the menu from the sprite window.

New sprite

New sprite leads to the **Create new sprite** dialogue box, from which you can create a new sprite. See page 81 for more information.

If you double-click on an unused part of the sprite file window the Create new sprite dialogue box is also displayed.

The icon bar menu

There is a further Paint menu, obtained by pressing Menu over the Paint icon on the icon bar.

Info

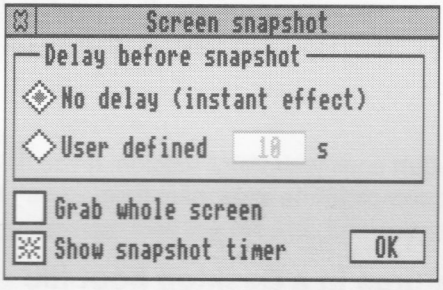
Info leads to a dialogue box containing details about the version of Paint.

Snapshot

Snapshot allows you to save part of the screen as a sprite file.

You start snapshot by choosing **Snapshot** from the icon bar menu; this displays the snapshot dialogue box.

The snapshot dialogue box allows you to alter the parameters involved in saving the screen:



Delay before snapshot allows you to select the time interval between clicking on the Snapshot box and the picture being taken. A time delay can be useful because it allows you to display transient items, like menus, on the screen before the picture is taken.

Grab whole screen does just that; it takes a picture of the whole of the visible screen.

Show snapshot timer shows a timer that gives a countdown of the time left before the picture is taken.

Using Snapshot

1 Open the directory where you want to save the captured sprite. Move this away from the area you want to grab.

2 Choose **Snapshot** from the Paint icon bar menu.

3 Set the parameters of your snapshot – **Delay**, **Grab whole screen**, **Show snapshot timer** etc.

4 Click on the **OK** button.

5 You will see a small icon of a camera with an arrow (unless you selected **Grab whole screen**, in which case the **Save as** dialogue box will appear immediately); move the point of the arrow to one corner of the area you want to capture.

6 Drag the icon and a bounding-box will appear, showing the area which will be captured as a sprite. When the box covers the required area, let go of Select, and the 'snapshot' process will start. If you left the **No delay** button on, the **Save as** dialogue box will immediately appear. If you requested a delay, the box will appear after the requested time lapse.

7 Drag the sprite to the appropriate directory display to save it.

Quit

Quit ends your Paint session; if you have not saved some of your files, Paint will prompt you to save them first.

Saving Paint features in a Desktop boot file

You may wish to change some aspects of the way new Paint windows appear when you first open them. For example, a new window normally opens with zoom magnification set to 1:1, but you may prefer to have the Zoom option set to 2:1 each time you start Paint.

You can set features of this type by setting up Paint as you wish to use it, then save these features by creating a Desktop boot file. Instructions on how to create a Desktop boot file are given in the RISC OS 3 *User Guide* in the chapter *Desktop boot files*.

There are several features of Paint that you can set before saving a Desktop boot file, so that they are set up the way you want them each time you switch on. The Paint features that will be recorded when you go through this process are known as Paint$Options.

Saving display features

Any Paint display features that you set before creating your boot file will be saved, so that the computer not only loads Paint, but sets the display features you have chosen.

If you wish to set the Paint display features, **without running Paint itself**, follow these steps:

1. Create a Desktop boot file, following the instructions above and in the RISC OS 3 *User Guide*.
2. Load the resulting !Boot file into Edit by dragging it onto the Edit icon (not by double-clicking: this will run the !Boot file).
3. Search for the line which runs Paint: this will read something like

   ```
   Run Resources:$.Apps.!Paint
   ```

4. Delete that line and resave the !Boot file.
   (Leave the line starting

   ```
   Set Paint$Options
   ```

   unchanged.)

Customising the Desktop boot file

If you change some of Paint's display features and then create a Desktop boot file using the Task manager, you can load the file into Edit to examine it. You will find a line reading

```
Set Paint$Options ...
```

where the string of letters and numbers corresponds to the display features you have selected.

Here are two examples:

```
Set Paint$Options DFW C+ T+ G7
```

This means show full info, use desktop colours, colours window and toolbox on, grid displayed in black (colour 7).

```
Set Paint$Options DDB CS T- Z4:1
```

This means show drawing and name, use BBC colours, small colours window on, toolbox off, zoom factor 4:1.

If you create a Desktop boot file automatically, you may still want to edit it later. The following list of options therefore shows the parameters for Set Paint$Options.

Letter	Feature controlled	Values	Possible Meaning
D	Sprite file window display	D or F	Drawing and name or Full info
		W or B	Desktop colours on (Wimp) or off (use BBC colours)
C	Colours displayed when new sprite window opened	+ or –	Colours window on or off
		L	Small colours off
		S	Small colours on
T	Toolbox displayed automatically	+ or –	Toolbox on or off
Z	Default zoom factor	*a:b*	Specifies zoom factor
G	Automatic grid display	+ or –	Grid on or off (at zoom factors of 4:1 or above); *n* specifies colour for the grid.
		n	

If you have not changed any settings for Paint, the line will appear in your Desktop boot file as:

```
Set Paint$Options ""
```

Default values

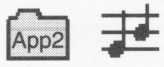
Default values for Paint are:

```
DDW C+L T+ Z1:1G+7
```

- Show drawing and name, use desktop colours.
- Display colours window (normal size) when a sprite is loaded.
- Display toolbox when Paint is loaded.
- Zoom 1:1 (normal size).
- Grid on with black grid lines.

When editing the Desktop boot file, you should make sure that the Paint$Options line is placed before the line the that runs the Paint application.

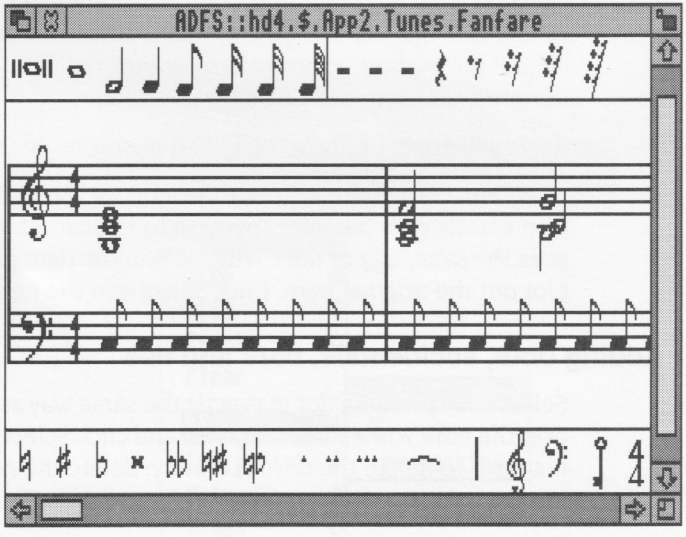
4 Maestro



Maestro enables you to transcribe music in standard musical notation and play it through the computer's own sound system; it also provides some simple editing facilities. The following description assumes that you are familiar with musical notation.

Install Maestro on the icon bar in the usual way (by double-clicking on its icon in the directory display). Display the Maestro window by clicking on the icon on the icon bar.

The best way to get started with Maestro is to load one of the tunes supplied as part of the Applications Suite. To do this, double-click on one of the tune icons in the **Tunes** directory, or drag it onto the Maestro icon on the icon bar. The window that appears looks like this:



The Maestro window is divided into three horizontal panels, with the stave in the centre. Scrolling affects only the central panel. Above and below the stave are toolboxes containing icons for notes, rests, clefs and other symbols.

To play the tune, click Menu to open the main Maestro menu. Click Select on **Play** to start the music. As the music plays, the score scrolls across the screen. Click **Play** again to stop the tune: another bar or so will play before it actually stops. To return to the beginning of the score, use the horizontal scroll bar.

Before setting up your own score, try out the following editing procedures on one of the tunes supplied on the disc.

Editing the score

Adding and deleting notes and rests

To add a note or rest, select the value you want by clicking on its icon in the pane above or below the score. The selected item will appear with a frame around it, and when you move the pointer onto the score window, a 'trial icon' appears, which moves around as you move the pointer. When the item is in the position you want, click Select. To get rid of the trial icon without adding a note or rest to the score and without selecting an alternative trial icon, press Menu, move the pointer off the Menu and press Select.

Notes may be placed anywhere; above and below each stave they will create their own ledger-lines. In the case of notes with stems, the stem trails behind the trial icon: if the pointer is moved downwards, the stem will be above the note; if upwards, the stem will be below the note.

Rests will appear only in their valid positions, in the centre of the stave.

To delete a note or rest, select the icon for the same value, and position the trial icon exactly over the item you wish to remove (it doesn't matter whether the stem goes the same way or not). When it is in the right place, the trial icon will appear to blot out the original item. Click Select and the item will be deleted.

Adding dots, accidentals, bars and ties

Select a lengthening dot in exactly the same way as a note or rest. Move the pointer over the note you wish to lengthen and click Select. To delete a dotted note, you do not have to delete the dot separately: delete the note and the dot will disappear too.

Select and place accidentals, bars and ties in the same way: like notes and rests, they will appear only in valid positions. A bar will be inserted across all the staves in the score when you click on one of them.

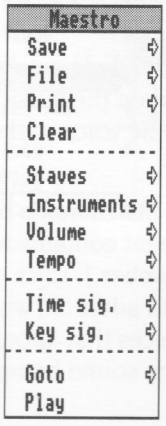
The tie character is of a fixed length, but when placed between notes of the same pitch, a single note will sound, with a duration equal to the two notes added together.

Adding clefs and key and time signatures

Clefs may be selected and placed like other items: they will appear only at the beginning of a bar.

Key and time signatures must be selected before they are positioned on the score. This is done using the Maestro menu, and the process is described in the appropriate section below.

The Maestro menu



As in any application, clicking Menu on the Maestro window will display the top-level menu.

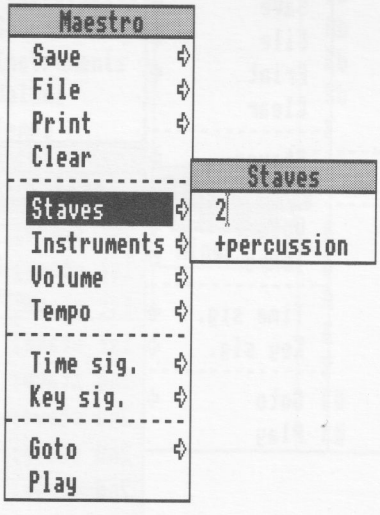
The **Save** procedure is exactly the same as for other applications such as Edit or Draw. Save a score by dragging the Maestro icon into the directory window where you want to save it, or by typing in the full pathname and clicking on **OK**.

File gives you some information about the file you are working on.

Print allows you to print your score on the printer.

Clear removes the current score from the stave but leaves the Maestro window on the screen.

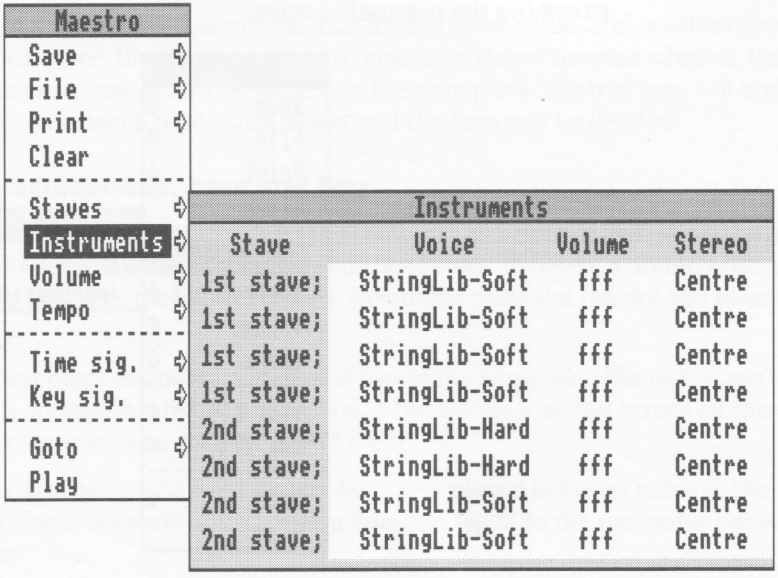
Staves displays a box where you can enter the numbers 1, 2, 3 or 4 (others are not accepted), and an option **+percussion**. Clicking on this option will add a single line percussion stave; when it is selected, the menu item is ticked. Click on it again to remove the percussion stave.

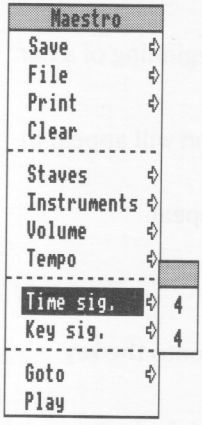


Instruments presents you with a full window containing a line for each voice on each normal stave you have selected, and a single line for the percussion stave (if selected). If you click on **Instruments**, the window will stay on the screen. There is a maximum of eight voices: if you have selected more than two staves, they will be distributed roughly equally between staves. You can scroll this window vertically in the normal way. The following properties can be set for each voice:

- **Voice** – Repeated clicking of Adjust takes you through the instruments available. Select takes you backwards through the options available.
- **Volume** – The volume of each voice can be set separately. Click Select to reduce the volume by one 'notch' and Adjust to increase it. To set the overall volume, use the **Volume** option on the main Maestro menu.
- **Stereo** – The position of each voice can be changed independently to any one of seven positions, so as to create a spread or stereo image when the music is played through more than one speaker. Click Select to move the voice to the left and Adjust to move it to the right.

If you have installed a MIDI expansion card in your computer, the **Instruments** box will have an extra column headed MIDI. The line for each instrument contains a figure 1 by default, indicating that it will play on MIDI channel number 1. Click on this number to change the channel number for each instrument. In addition, when a MIDI card is installed a **MIDI only** entry is added to the set of voices that appears when you click on the voice entry; choose this entry to prevent any sound being played through the computer's own speaker(s).





Volume enables you to set the overall volume on a scale from ppp to fff.

Tempo allows you to set the tempo on a scale from largissimo to prestissimo.

Time signature presents you with a small box containing a time signature. Position the pointer over the upper number; successive clicks cycle the values from 2 to 16. The lower number can take values of 2, 4, 8 and 16 only.

To assign a time signature to a score (or to add a new time signature in the middle of a score):

1 Make your choice using the Maestro menu.

2 Choose the '4/4' icon from the Maestro window.

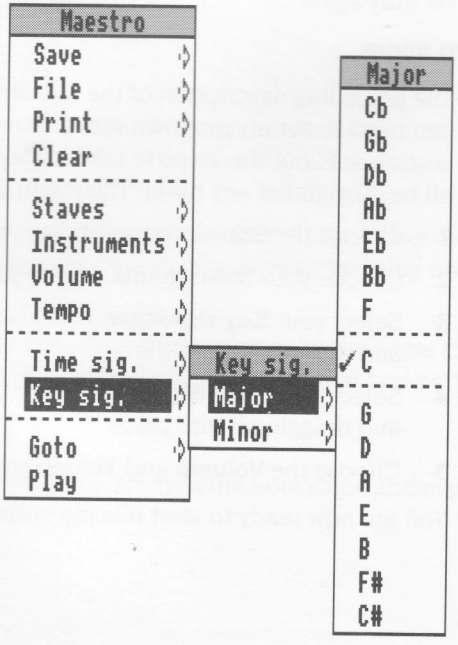
3 Position the pointer where you want the time signature to appear.

4 Click Select.

The selected time signature will appear on all staves.

To delete a time signature, select the 4/4 icon, move the pointer onto the time signature and click Select.

The **Key signature** menu tree is displayed by choosing the **Key sig.** option.



The **Key signature** menu tree first asks you to choose between major and minor keys. Taking the major path offers you a set of key signatures with C at the centre, 'flat' key signatures grouped above and 'sharp' signatures below. For minor keys, A is at the centre.

To place a key signature at the beginning of a score, or at the beginning of a bar:

1 Make your choice using the Maestro menu.

2 Choose the 'key' icon from the Maestro window (the trial icon will appear in the form of the selected key signature).

3 Position the pointer where you want the key signature to appear.

4 Click Select.

The selected key signature will appear on all staves.

To delete a key signature, select the key icon, move the pointer onto the key signature and click Select.

Goto presents you with a box into which you type the number of the bar you wish to move to.

Play starts the tune playing from the point displayed on the screen. To stop, click on **Play** again.

Setting up your own score

The preceding description of the Maestro menu options gives you the information you need to set up your own score. However, for the sake of clarity, the following section sets out the steps to take in their most convenient order (though they can all be changed at any time). The menu options are shown in bold type.

1 Choose the **Staves** you want.

2 Choose your **Instruments**, and their volume and position.

3 Select your **Key signature**, and place it on the score by selecting the key icon and dragging it into place.

4 Select your **Time Signature**, and place it on the score by selecting the 4/4 icon and dragging it into place.

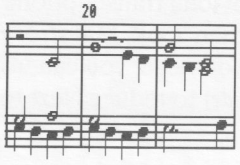
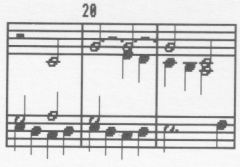
5 Choose the **Volume** and **Tempo** you want.

You are now ready to start placing notes on the staves.

Some tips

If you copy a piece of music from a written score it will occasionally need some minor modifications to play correctly.

Fugues

In fugues scored for the keyboard, several distinct parts may be written on one stave. In the following example from a Shostakovich fugue, bar 20 contains a semibreve G belonging to the top part, and in the second half of the bar, two crotchets belonging to the middle part, which had started bar 20 in the bass stave.

Maestro tries to play these three notes in succession, not understanding that the first crotchet should start half way through the semibreve. Since the semibreve is long enough to complete the bar by itself, the two crotchets are lost. The solution is to write the top line like this:

This indicates to Maestro that the crotchet E starts half way through the bar. Problems of this type can generally be resolved by splitting notes into shorter notes tied together.

Note also that Maestro does not allow two rests in the same time slot on one stave, as is sometimes done in fugues to indicate that two parts are silent.

Staccato

To achieve the effect of staccato, shorten the note value and make up the difference with a rest.

Grace notes and trills

These are not implemented as such, but the effect can be achieved by entering notes of the appropriate small duration, and deducting their value either from the note they would normally be attached to (for an appoggiatura) or from the preceding note (for an acciaccatura). Very effective trills can be produced using an elaborated form of the same method.

Maestro's use of memory

Maestro cannot extend its memory slot once it has started up. It therefore takes at least 256K, to allow for the editing of long transcriptions. However, if the Next slot in the Task manager is set to more than 256K, Maestro will use up all the space in Next. Since this may be more than you need, you can use the Task manager (described in the RISC OS 3 *User Guide*) to reduce Next to 256K, before loading Maestro.

Part 2: Desktop tools

5 Alarm

Alarm, as you might expect, is a sophisticated alarm clock. It can

- display an analogue or digital clock on the icon bar
- set the computer's date and time clock
- set up alarms that can go off at any time in the future
- set up applications so that they are automatically started at a particular time
- set up urgent and repeating alarms.

Starting Alarm

Alarm is supplied as an application, stored in the Apps directory on the icon bar. To start Alarm, click on the Apps icon on the icon bar to display the Apps directory, then double-click on the Alarm icon. When it has finished loading, the Alarm clockface appears on the icon bar.

To display the Alarm menu, press Menu on the Alarm icon on the icon bar. Alarm settings are changed using this menu and associated dialogue boxes.

Alarms can be stored by the alarm application automatically and remembered even if you switch off the computer. However this facility only operates if you save your Alarm files to disc. See page 135 for more details.

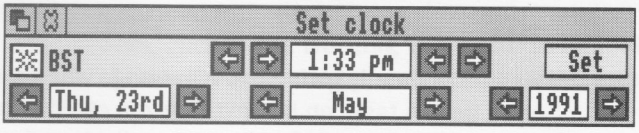
Setting the time

The **Set clock** dialogue box is used to set the clock's time and date.

To display the Set clock dialogue box:

1 Click Menu over the Alarm icon on the icon bar. This displays the icon bar menu.

2 Choose the **Set clock** option.



To change the time and date:

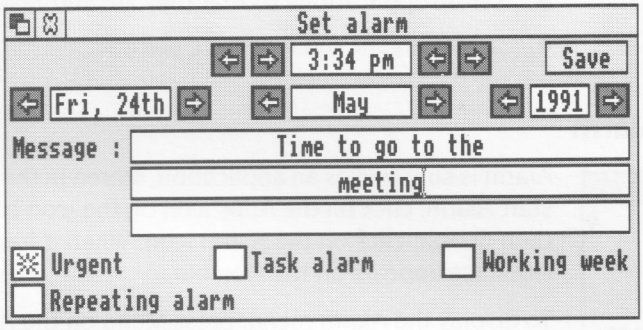
1 With the Set clock dialogue box, set the time and date by clicking on the appropriate arrows. Click on **BST** if British Summer Time is in operation.

2 Click on Set to reset the clock to the new time.

The new time and date applies to the entire RISC OS system, not just to Alarm.

Setting an alarm

This section shows you how to set an alarm. All alarms are set from the **Set alarm** dialogue box. To display the Set alarm dialogue box, simply click Select over the time display icon on the icon bar.



You are presented with a dialogue box in which to set the alarm date and time, and a space in which you can, if you wish, enter some text which will be displayed when the alarm goes off.

To set the time and date of the alarm, click on the arrow boxes. Click on **Save** to set the alarm. When an alarm is set, the box surrounding the time display on the icon bar changes colour.

The following options are available:

Urgent

An alarm may be marked as urgent by clicking on the **Urgent** box. It will then sound an audible alarm when it goes off, even if you have selected the **Silent** option from the setup dialogue box menu.

Task alarm

Instead of merely giving you a message when an Alarm goes off, Alarm can carry out a task. A task can be anything you can do on the Desktop or command line: running a program or loading an application, for example. Click on the **Task alarm** box and enter the command you want carried out in the message boxes. You can

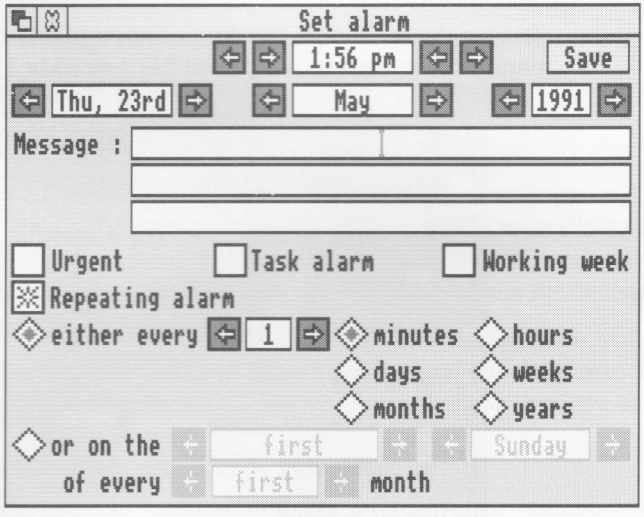
also set up a Task alarm by dragging a file onto the Set alarm window. If you drag an application onto the window, for example, that application will run at the time set for the alarm. If you drag a text file, the text will be displayed in an Edit application window; you might use this option to display, at the start of the day, a list of things you have to do.

Working week

This limits the alarm settings for any new and repeating alarms to be within the specified working week; the working week is defined in the Alarm Setup window, and is Monday to Friday by default. This option only takes effect if the Repeating alarm option is also selected.

Repeating alarm

You can set an alarm to go off more than once by clicking on the box marked Repeating alarm, which displays the repeating alarm options.



Choose whether you want the alarm to repeat at a set time (for example, every 19 days) or on a set day (for example, every second Monday of every second month).

Alter the repeat interval by clicking on the arrow boxes, and by selecting the unit in which the interval is measured from the buttons shown. To limit just the current alarm to the working week, click on the **Working week** box. To limit **all** your alarms to the working week, choose the Repeating alarms option in the setup dialogue box.

You can set more than one alarm by simply repeating the Set alarm procedure.

Configuring the Alarm setup options

The setup dialogue box allows you to configure

- how alarms are acted upon
- how the alarm database is used
- the alarm display format
- GMT and BST time zone switching.

To change the Setup dialogue box options:

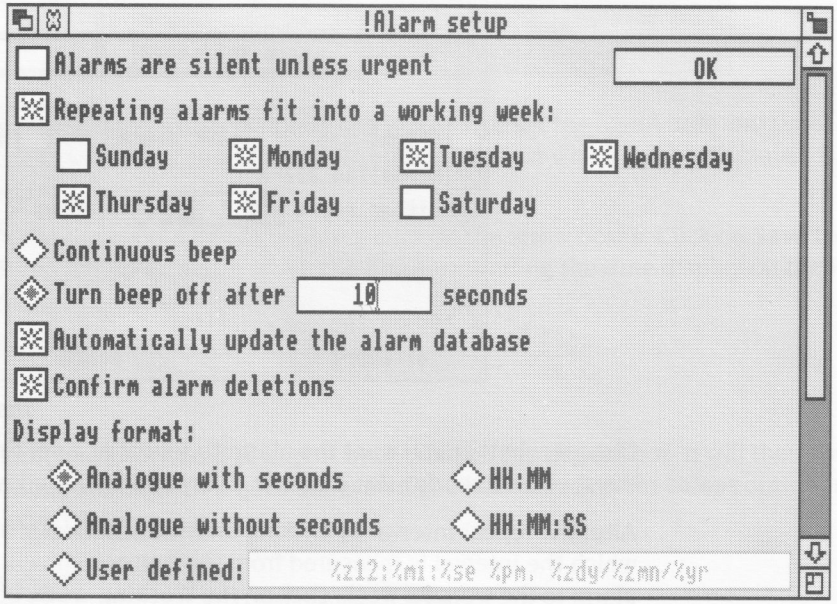
1 Click Menu over the Alarm icon on the icon bar. This displays the icon bar menu.

2 Choose the **Setup** option.

3 Change the dialogue box options you wish to.

4 Click on the OK box. The saves the new options for your current session. However when your computer is reset, these changes will be lost.

To save these changes permanently you must update the Alarm$Options parameter in your Desktop boot file. See page 136 for more information.



The following configuration options can be altered with this dialogue box. Select the alarms by clicking in the empty box. A star in the box denotes that the option is already selected; click on the star to deselect it.

Alarms are silent unless urgent

When this is selected, only urgent alarms sound an audible beep at alarm time. When it is not selected all alarms sound an audible beep.

Repeating alarms fit into a working week

When this is selected, any subsequent repeating alarms you set, or alarms that you defer, will skip those days you have not selected. An alarm repeating monthly or annually will go off on the working day before its due date.

Continuous beep

Click on this box if you want an audible alarm to sound continuously until you cancel the alarm.

Turn the alarm beep off

The figure you type into the box is the number of seconds that the computer's beep will sound when there is an alarm.

Automatically update the alarm database

Once you have used the **Save as alarms** option in the browser dialogue box, Alarm knows where to find your alarm database file. Choosing this option lets Alarm automatically update the alarm database file whenever you set or change an alarm.

If you select this option without first setting an Alarms database, you will see an error message and your Alarm file will not be stored in the database. Set an Alarms database by double-clicking on an Alarms file or by using the Save as alarms option on the Alarms browser menu.

Confirm alarm deletions

When this option is selected, you are prompted for confirmation each time an existing alarm is deleted.

Display format

This section allows you to choose how you wish the alarm clock to be displayed on the icon bar. The formats available are:

- analogue (with and without a second hand)
- digital (with and without seconds displayed) – called HH:MM and HH:MM:SS
- your own format.

Typing in your own formats:

For example, try typing in these formats in the **User Format** box.

```
%z12:%mi:%se %pm %zdy/%zmn/%zyr
```

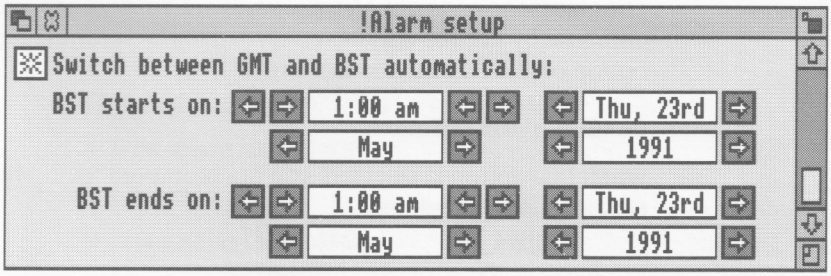
and

```
%we %zdy%st %m3 Week %wk
```

For information on how to set up your own formats, see the section entitled *Time and date display formats* on page 137. The format and other features you select for Alarm will be saved in any Desktop boot file you create (providing Alarm is running when you save the file). These options are listed at the end of this chapter. For information on how to create a Desktop boot file, refer to the chapter *Desktop Boot files* in the RISC OS 3 *User Guide*.

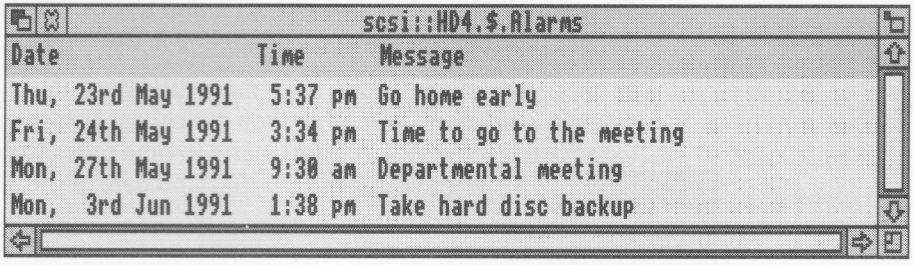
Switch between GMT and BST automatically

When this option is selected, Alarm will automatically switch between GMT and BST times on the dates you specify. Click on the arrows to change the time, day, month and year.

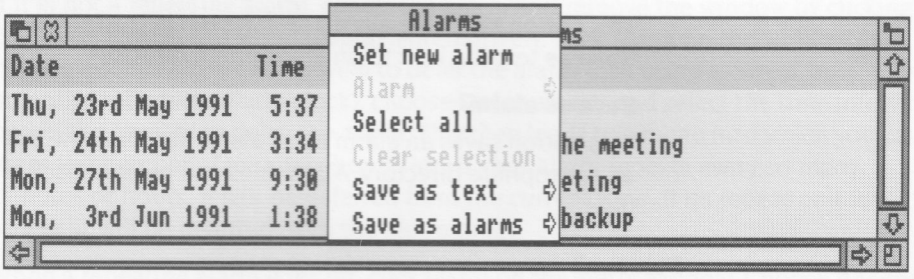


Browsing through your alarms

Clicking on **Alarms...** on the icon bar menu displays the alarm browser. The browser lists the alarms you have set.


scsi::HD4.$.Alarms
Date
Time
Message
Thu, 23rd May 1991 5:37 pm Go home early
Fri, 24th May 1991 3:34 pm Time to go to the meeting
Mon, 27th May 1991 9:30 am Departmental meeting
Mon, 3rd Jun 1991 1:38 pm Take hard disc backup

Clicking menu over the browser window displays the menu options available for setting, changing, copying, deleting and saving alarms.



The Alarms browser menu

Set new alarm

Choosing this option displays the Set alarm dialogue box.

Alarm

This option is only available when an alarm is first selected. Select an alarm by clicking on an alarm line in the browser.

This option displays a submenu which allows you to perform the following operations:

Change alarm

This displays the Change alarm dialogue box. Use this in the same way as the Set alarm dialogue box. The change alarm box can also be displayed by double-clicking over the appropriate line in the browser.

To choose a different alarm to change, click Menu in the dialogue box. This displays a submenu from which you can choose **Previous alarm** or **Next alarm** to move to the previous or next alarm in time order. Choose **Find alarm** to locate an alarm by specifying the time and date of the alarm.

Delete alarm

Use this option to delete an alarm.

Copy alarm

Use this option to copy an alarm so that it is duplicated in the alarm browser. You can then use the Change alarm option to modify the copied alarm.

Save as text

This option saves the alarm text (as seen in the browser) as a text file. Drag the **Save as** text file icon to an appropriate directory.

Save as alarm

This option saves an alarm as an alarm file. Drag the **Save as** alarm file icon to an appropriate directory. Alarm files can be read back into Alarm at a later date.

Select all

Selects all alarms in the browser.

Clear selection

Deselects all selected alarms in the browser.

Save as text

This option saves the selected alarm text (as seen in the browser) as a text file. Drag the **Save as** text file icon to an appropriate directory.

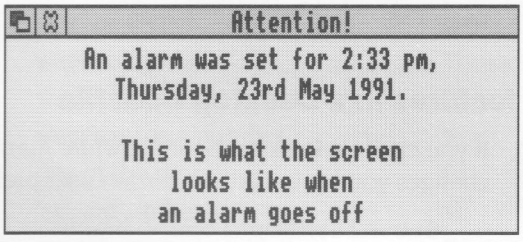
You can load this text file into Edit to display a list of all your currently set Alarms, or, if you have a printer driver installed, drag the icon straight onto the printer driver icon to print the list on paper.

Save as alarms

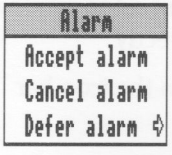
This option saves the selected alarms as an alarm file. Drag the **Save as** alarms file icon to an appropriate directory. Alarm files can be read back into Alarm at a later date.

When the alarm goes off

When the alarm time is reached, a window similar to the illustration below appears on the screen.



If it is not a repeating alarm, cancel the alarm and remove the window by clicking the Close icon in the alarm display. Alternatively, click Menu on the window and choose **Accept alarm**. If you wish to defer the alarm (like using a 'Sleep' button on an ordinary bedside alarm clock), choose **Defer alarm**, and select the time interval by which you want to delay the alarm. This then leads to a menu into which you can enter the number of minutes, hours, etc. If your alarm repeats every so many minutes or hours, it will be deferred from the current time. If its repeat unit is longer, it will be deferred from the alarm time.



When a repeating alarm goes off, click Menu on the alarm window. Choose **Accept alarm** to stop the alarm and remove the window, leaving the alarm set for next time, or choose **Cancel alarm** to stop it going off again.

If Alarm is not running when the alarm is due to go off, the alarm will be triggered next time Alarm is started. If the alarm is a repeating alarm, you will receive a message for the first repeat due for the period when Alarm was not running, but not for subsequent ones.

Quitting Alarm

To close down Alarm, select **Quit** from the icon bar menu. Alarm will warn you if you have any alarms that have not been saved.

Alarm data files

Alarm data files contain information about the currently held alarms. If you double click on an alarms file and Alarm is not running, then Alarm is started and the data file is read and treated as the main alarm file. If you double click on an alarms file and Alarm is currently running, the contents of the alarms file is added to the existing list of alarms, if there are any.

If you have an alarms file that was saved using a pre-RISC OS 3 Alarm application you will need to convert the file into the new alarm format using the application !AlarmConv. This is described in the section entitled *Converting old Alarm data files* on page 138.

Saving Alarm features in a Desktop boot file

If you create a Desktop boot file while Alarm is running, it will incorporate any changes you have made to certain user preferences in a line beginning

```
Set Alarm$Options
```

You can also manually edit your Desktop boot file to incorporate these lines. See the section *Desktop boot files* in the RISC OS 3 *User Guide* for more information.

Alarm$Options

The Alarm$Options also uses the values of –timeout, –weekwork and –format to set up Alarm. It is, however, much easier to set these using the Alarm setup window and then to save a Desktop boot file than to edit these options directly.

Alarm$Options controls the format of the time and date display on the icon bar when the Display format is set to **User defined**. By default, it is

```
-format %z12:%mi:%se %pm. %zdy/%zmn/%yr
```

This will produce displays like this:

12:12:32 pm. 23/1/90
1:15:30 am. 1/12/89

For full information on time and date formats, see the next section.

Time and date display formats

The date and time format can be set by giving the system variable Alarm$Options a string made up of time and date variables as listed below.

Name	Value	Example
%se	seconds	59
%mi	minutes	05
%12	hours in 12 hour format	07
%24	hours in 24 hour format	23
%am or %pm	'AM' or 'PM'	pm
%we	weekday, in full	Thursday
%w3	weekday, in three characters	Thu
%wn	weekday, as a number	5
%dy	day of the month	01
%st	'st', 'nd', 'rd' or 'th'	st
%mo	month name, in full	September
%m3	month name, in three characters	Sep
%mn	month as a number	09
%ce	century	19
%yr	year within century	87
%wk	week of the year, Mon to Sun	52
%dn	day of the year	364
%0	insert an ASCII 0 zero byte	
%%	insert a %	

Numbers are generated as a fixed width with leading zeros (e.g. %mi can give a result of 05). To remove leading zeros, prefix the code with a z (e.g. %zmi gives a result of 5).

Plain text can also be included in the variable string; for example:

```
%we the %dy%st %m3 %yr
```

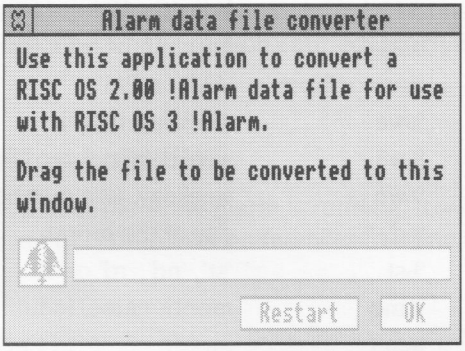
would display in the form:

```
Wednesday the 21st Jan 84
```

Converting old Alarm data files

If you have been using a pre-RISC OS 3 version of Alarm and you have saved some alarms, you will need to use the AlarmConv application to convert these alarms into a new-style alarm file.

1 Start AlarmConv by double clicking on its icon. This displays the conversion window.


Alarm data file converter
Use this application to convert a RISC OS 2.00 !Alarm data file for use with RISC OS 3 !Alarm.
Drag the file to be converted to this window.
Restart
OK

2 Go to your old Alarm application and while pressing down the Shift key, double-click on the Alarm application icon. This opens the alarm application directory.

3 Locate the old alarm data file, called !Alarm. Drag this file from the Alarm application directory onto the AlarmConv window.

4 Click on **OK**. This automatically converts the data file into the new format.

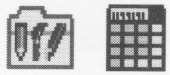
5 Drag the Alarm Bell icon from the AlarmConv window into the directory display in which you want to keep your Alarms file.

If you want to convert another old Alarm data file, click on **Restart** to reset the program and then drag the next data file onto the window.

When you have finished using the program, click on the Close icon in the AlarmConv window and Close the old Alarm application window.

You should also remove the old Alarm application from disc so that you are sure that you are always using the new !Alarm.

6 Calculator



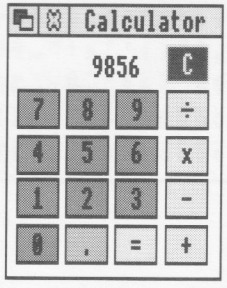
The 'Calculator' allows you to use your computer for simple arithmetic. Double-click on the Calculator icon in the Apps directory display to install the Calculator icon on the icon bar. Click on the icon on the bar to display the calculator.

The screen calculator is like a simple four-function (add, subtract, multiply and divide) electronic desk calculator. 'Press' the number and function keys on the calculator keypad by clicking the mouse on the square you want. The number calculated is displayed in the number window above the keys.

If you prefer, you can also use the numeric keypad on the keyboard to enter numbers. You must have the Num Lock key enabled for the numeric keypad to work. The Enter key corresponds to the Equals button and the Delete key corresponds to the Clear button.

Some operations, such as division by zero, will cause an error message to appear. Clear this by clicking on C (Clear).

Remove the Calculator from the desktop by clicking on the Close icon. The Calculator can be activated again from the icon bar when you need it. To remove it from the icon bar, choose Quit from the Calculator's icon bar menu.



There is a more advanced scientific calculator, SciCalc, also supplied. See page 149 for information about this application.

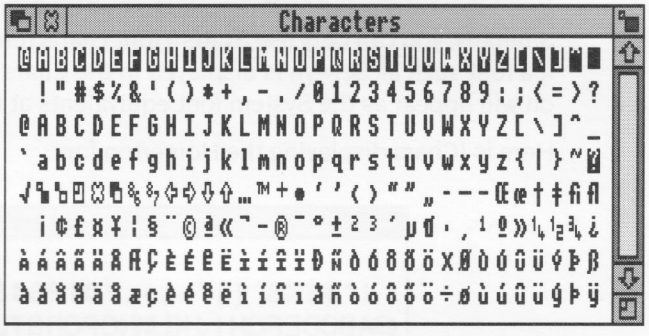
7 Chars

Chars is an application that enables you to use text characters that are available on your computer but that cannot be typed in easily using the keyboard.

Double-click on the Chars icon to start the application; its window will open immediately (no icon appears on the icon bar).

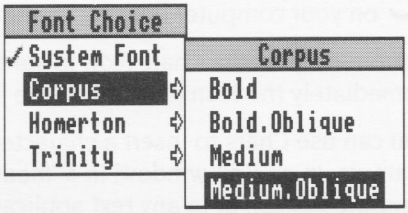
You can use Chars to insert a character at any time when you are typing text: for example, in an Edit window, in a 'menu item' (such as the **New directory** or file **Rename** boxes), or in any text application.

To use a character, click on it. It will appear at the caret position in the current window (the window with the cream-coloured Title bar). You can also insert a character by positioning the pointer over the one you wish to use, and pressing Shift. You will need to use this method if you want to use a character from Chars as part of a filename (by entering it into a **Save as** dialogue box), since clicking on the Chars window would make the **Save as** box disappear.



Using different fonts with Chars

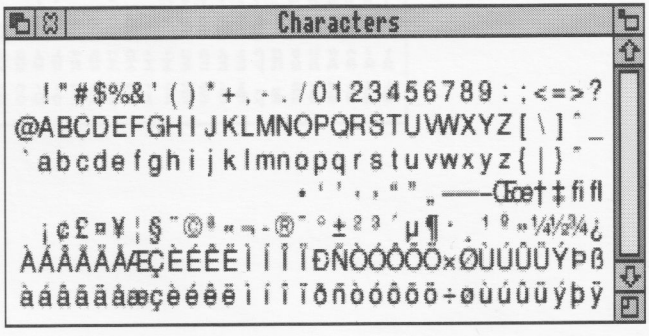
When you first run Chars, the font that appears will be the System font. If you want to use a different font, press Menu on the Chars window to obtain a menu of all the currently-available fonts, and click on the one you want. The characters for that font will appear in the Chars window.



You will also need to select the corresponding font in the application you are using, otherwise the characters you choose will appear in the font in use around the caret. For example, suppose the caret is in the middle of an text line displayed in Trinity Medium. Even if you display the Selwyn font in your Chars window, any characters you select from Chars will appear in the corresponding Trinity Medium form, rather than in Selwyn.

Similarly, you can only use System font characters for naming files and directories; if a font such as Selwyn is displayed in the Chars window, the characters you click on will appear as the System font equivalents at the insertion point.

Here is !Chars displaying the Homerton font:



Entering control codes

With the system font only, characters shown in inverse video correspond to control characters. For example, clicking on inverse L is the same as typing Ctrl-L.

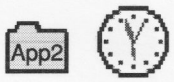
Advanced notes

The characters entered using !Chars can also be entered using Alt+numeric keypad combinations.

To enter a character using the numeric keypad, hold down the Alt key, type the number on the numeric keypad, then release Alt. The numbers correspond to letters in the Latin 1 alphabet.

For example, Alt 64 will enter the @ character.

8 Clock

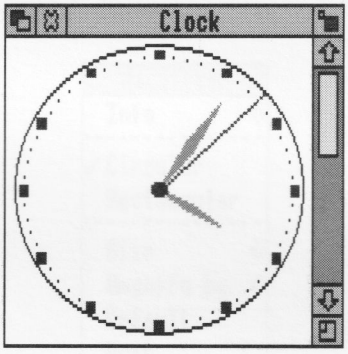


Clock is an analogue clock face with hour, minute and second hands.

To display the clock window, double-click on the Clock icon in the relevant directory display.

The clock may be moved, re-sized and removed like any other window.

To **set** the time, use the Alarm application.



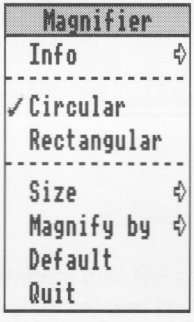
9 Magnifier

Magnifier is a program for detailed examination of the screen.

To run Magnifier, double-click on its icon. A magnifying glass icon will appear on the icon bar. To activate the magnifying glass, click on this icon. The magnifier will appear at the pointer position. Click Menu to revert to the normal pointer.

To increase the magnification, press Adjust; to reduce it, press Select.

Press Menu on the icon bar icon to obtain the Magnifier menu, which allows you to change the way the application behaves:



Info leads to information about the version of Magnifier you are running.

Circular and **Rectangular** allow you to change the shape of the 'lens' to a circle or a rectangle, according to your preference. Click on the option you want.

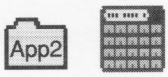
Size leads to a box into which you can type the width you want for the lens. The units used here are OS units (operating system units), which are 180 to the inch.

Magnify by leads to a box into which you can type the magnification factor you want. To reduce by a factor of two, type 0.5.

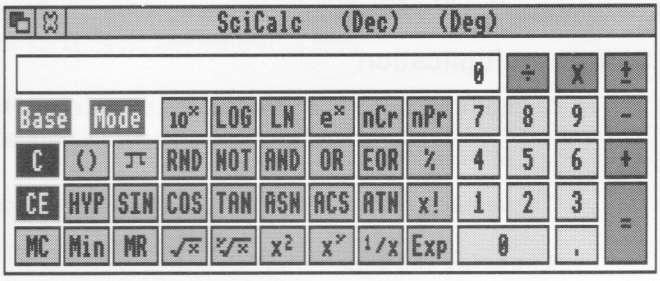
Click on **Default** to restore the default shape, size and magnification factor (circular, 128 OS units wide, magnifying by two).

Click on **Quit** to remove Magnifier from the icon bar.

10 SciCalc



SciCalc is a calculator providing a range of scientific functions in addition to simple arithmetic ones. Load it by double-clicking in the normal way; click on the icon bar icon to display the following window:


SciCalc (Dec) (Deg)
0
÷ X ±
Base Mode 10^x LOG LN e^x nCr nPr 7 8 9 -
C ( ) π RND NOT AND OR EOR % 4 5 6 +
CE HYP SIN COS TAN ASN ACS ATN x! 1 2 3 =
MC Min MR √x ∛x x² x^y 1/x Exp 0 .

Entering numbers

There are two ways of entering numbers into the calculator. You can use the mouse to move the pointer over the required key and then click, or you can use the keyboard directly. Clicking in the numeric display turns the title bar a cream colour, indicating that numbers and selected operators may be entered from the keyboard. When the title bar is grey, the keyboard does not affect the state of SciCalc.

If you use the numeric keypad, make sure that the Num Lock key is on. The function keys in the numeric keypad are also equivalent to those on the calculator keypad.

Simple arithmetic functions

These operate exactly like an ordinary calculator, except that you can enter numbers and operators (+, –, etc) either by clicking on the SciCalc display or by using the numeric keypad on the keyboard. When you enter a number it appears in the calculator's display. When you first load SciCalc it is set for normal **decimal** arithmetic (to base 10). This is denoted by the word (Dec) in the title bar.

Rules of precedence

SciCalc treats the calculation you enter as a formula and does not perform the calculation until you click on the Equals button. SciCalc performs the calculation according to the precedence of operators. From highest to lowest; Multiply, Divide, Add and Subtract.

Multiplication takes place before addition so:

2 + 6 * 5 = 32 (not 40)

You can change the order of calculation by using brackets:

(2 + 6) * 5 = 40

Simple multiplication

To multiply 2 by 5 and view the result, enter the following in this order:

2 x 5 =

The result will appear in the display.

Changing the sign

The ± key switches the sign of x.

Calculating percentages

The percentage function operates as follows: to increase x by y percent, press:

x + y %

To decrease x by y percent, type – instead of +.

Clearing the last entry

Press CE to clear the current display. For example, pressing the following:

2 + 6 x 3 CE 5 =

calculates

2 + 6 x 5 =

and thus gives the result 32.

Erase all calculations - Clear

Press C to clear not only the display but also the whole input so far.

Using the memory

SciCalc has a single memory. To enter the displayed value into the memory, press `Min`. To display the contents of the memory, press `MR`. To clear the memory, press `MC`.

More advanced mathematical functions

Calculating roots

To calculate the **square root** of x, press $\sqrt{x}$.

To obtain the yth root of x, press $y\sqrt{x}$, followed by y. For example, to calculate the fourth root of 52, click on the following keys:

52 $y\sqrt{x}$ 4 =

which will display the result 2.685349614.

Calculating squares and powers

To calculate the **square** of x, click on x^2.

To raise x to a power other than 2, click on x^y followed by the power you want to take. For example, to raise 52 to the power 4, click on the following keys:

52 x^y 4 =

which will display the result 7311616.

To raise 10 to the nth power, press 10^x.

To raise e to the nth power, press e^x. (e is defined as 2.7182818).

Calculating reciprocals and factorials

For the **reciprocal** of x, press `1/x`.

For x **factorial**, press `x!`.

Calculating logarithms

To obtain the **logarithm** (base 10) of x, press `LOG`.

For the **natural logarithm** (base e), press `LN`.

Using brackets

To obtain a bracket, press `( )`. The same key produces a left or right bracket, whichever is appropriate in the context. For example, to calculate (2 + 3) x 5, press

`( ) 2 + 3 ( ) x 5 =`

(There is only one level of brackets available.)

Using π

To use π in a calculation, press π.

Calculating exponents

To express x in exponent form, press `Exp` followed by y, the exponent. For example,

`50 E 4 =`

displays the result 500000.

Trigonometric functions in base 10

Among the more advanced functions available in SciCalc are the standard trigonometric functions:

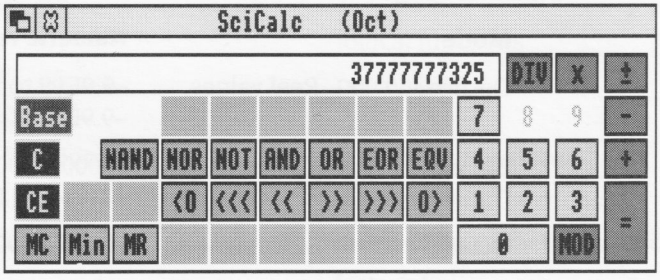
`SIN`	sine
`COS`	cosine
`TAN`	tangent
`ASN`	arcsine (sine^{-1})
`ACS`	arccosine (cosine^{-1})
`ATN`	arctangent (tangent^{-1})

To obtain hyperbolic trigonometric functions, press `Hyp` before pressing the function button.

Changing the base and mode

As already mentioned, when first loaded SciCalc works to a decimal base. Successive clicks on `Base` switch to binary (base 2), octal (base 8) and hexadecimal (base 16) bases. The current base is shown in the Title bar. The calculator layout is modified to provide the input requirements for each base: for bases using fewer than ten characters, some are greyed out, while for hex, some of

the function keys are replaced with the necessary letters. In addition, when a function is not available in a base, it is greyed out. For example, in base 8 SciCalc looks like this:



`Base` provides a handy way of converting a number between bases. Once you have entered a number into the display, clicking on `Base` converts it successively to the other bases.

In decimal base, you can also obtain alternative modes by clicking on the `Mode` box. This switches between degrees, radians and gradians; the current unit is shown in the Title bar. For example, to express 50 degrees in radians, switch to decimal base and degree mode, enter 50, and click on `Mode` so that the Title bar shows `(Rad)`. The display changes to show the value 0.87266463.

Note that changing from decimal to a non-decimal base will round the currently displayed value to the nearest integer, but has no effect on previous parts of the current calculation. Rounding also occurs on numbers being recalled from memory in non-decimal bases.

Logic functions in the non-decimal bases

In the non-decimal bases – binary, octal and hexadecimal – the arithmetic functions are augmented by a `MOD` function. In addition, the scientific functions are replaced by logic functions: `NAND`, `NOR`, `NOT`, `AND`, `OR`, `EOR`, `EQV`, rotate, arithmetic shift and logic shift.

Technical notes

Its accuracy is limited to that of BASIC VI – 64 bit floating point.

Numeric range

Mode		Numeric range
Decimal	Real values	–9.9E99 to 9.9E99 entry –9.9E307 to 9.9E307 displayable
Binary	32bit signed	10000000000000000000000000000000 to 11111111111111111111111111111111
Octal	32bit signed	20000000000 to 17777777777
Hexadecimal	32bit signed	80000000 to 7FFFFFFF

Accuracy

Mode	Accuracy	Number of digits displayed
Binary	Absolute	32
Octal	Absolute	10 - 11
Hexadecimal	Absolute	8
Decimal	64 bit FP	10 or 10 + 2 digit exponent

Note: real number underflow is not trapped.

Calculator functions and their keyboard equivalents

Calculator	Keyboard	Function
0..9	0..9	numbers
+, –, x, ÷, =,	+, –, *, /, =	standard operators
	Return, Enter	same as =
±	#	change sign on number or exponent
Exp	E	allows entry of exponent
.	.	decimal point
10x, LOG, LN, eX		exponential and logarithmic functions
nCr		combination
nPr		permutation
()	(,)	brackets (one level only)

Calculator	Keyboard	Function
π		the number Pi
RND		random number between 0.0 and 1.0
NOT, AND, OR, EOR		logical functions
%	%	percentage
HYP (followed by a trig function)		hyperbolic functions
SIN, COS, TAN		trigonometric functions
ASN, ACS, ATN		inverse trigonometric functions
x!	!	factorial
√x		square root
y√x		Yth root of X
x^2		square
x^Y	^	X raised to the power Y
$^1/_x$		reciprocal
C	Delete	clear calculation
CE		clear current number only
MC		clear memory
Min		memory in
MR		memory recall
Mode		select radians/degrees/gradians
Base		select decimal/binary/octal/hexadecimal base

Alternative keys in non-decimal bases

Calculator	Keyboard	Function
NAND		NOT AND
NOR		NOT OR
EQV		NOT EOR (equivalence)
<O , O>		rotate left or right
<<< , >>>		logical shift left or right
<< , >>		arithmetic shift left or right
DIV		integer division
MOD		modulus (integer remainder)
A - F	A - F	hexadecimal base digits

Operator precedence

Operators are evaluated in the following order of precedence (highest shown first).

unary operators
$y\sqrt{x}$
x^Y
nCr, nPr
*, /, DIV, MOD
+, –
<O, O>, <<, >>, <<<, >>>
AND, NAND
OR, EOR, NOR, EQV

Saving SciCalc features in a Desktop boot file

You may wish to change some aspects of the way SciCalc operates. For example, the position of the SciCalc window when it is opened.

You can set features of this type by setting up SciCalc as you wish to use it, and then save the features by creating a Desktop boot file; instructions on how to create a Desktop boot file are given in the RISC OS 3 *User Guide*.

Customising the Desktop boot file

The SciCalc window can be opened at a chosen place on the screen when SciCalc is run, by editing your Desktop boot file and inserting the system variable SciCalc$Window. For example:

```
Set SciCalc$Window 700,900
```

The numbers are the x and y graphics coordinates for the bottom-left corner of the displayed window.

You can also choose a particular base and trigonometric mode in which SciCalc is to start, by setting SciCalc$Options, for example

```
Set SciCalc$Options 2,1
```

The first number specifies the base, the second the mode. Allowed values are

Base -	1 Decimal	2 Binary	3 Octal	4 Hexadecimal
Mode -	1 Radians	2 Degrees	3 Gradians	

The last example sets the base to binary and the trigonometric mode (used when you next change to decimal base) to radians. The default values are 1,2 – decimal and degrees.

11 The BBC emulators 65 Host and 65 Tube

An emulator is a piece of computer technology which makes your computer system behave like, or **emulate**, another computer system. You can then run on your system many software and hardware applications that were originally developed for the other system.

What the BBC Model B emulator does

The BBC Model B emulator offers you two different emulators, each of which makes the computer behave like another system:

- **65Host** makes it possible to run many applications on a RISC OS computer that were originally written to run on a BBC Model B.
- **65Tube** makes it possible to run many applications on a RISC OS computer that were originally written for the 65C02 second processor.

The BBC Model B emulator contains a copy of the BBC Model B operating system - including, for full compatibility, any bugs it contains! This helps us provide a particularly good emulation of the BBC Model B:

- Not only can both emulators run programs written in BBC BASIC (including its built-in assembler); they can also run machine code (including programs compiled from high-level languages).
- Both emulators should correctly run programs that use hardware add-ons, providing the programs have been written following our guidelines.

If you've got a different 6502-based Acorn computer (such as a BBC Model B+, Master 128 or Master Compact) you'll still find the BBC Model B emulator useful. This is because many applications for these systems are written to run also on a BBC Model B computer.

More information

This chapter is a shortened version of the User Guide in the BBC *Model B Emulator pack* (SKB10). This pack consists of an expanded User Guide and a number of utility programs to help you port existing 6502-based software to RISC OS. Contact your dealer for more information.

What to read next

The emulators

The section entitled *65Host and 65Tube* overleaf gives more information about the emulators, and the facilities they provide. It also outlines some of the reasons why they may be unable to run a particular program.

Transferring programs to RISC OS

There are a number of stages in trying to run a program on a RISC OS computer when it was originally written for a 6502-based computer. Successive sections take you through each of these stages:

- Firstly you need to be able to load the program into your RISC OS computer. In many cases this will mean transferring software from a medium that only 6502-based Acorn computers can use (such as a 5¼" DFS or ADFS disc) to one that RISC OS computers can use (such as a 3½" ADFS disc). The section entitled *Transferring files to* RISC OS on page 165 tells you how to do this.
- Once you've transferred a program to RISC OS, the next thing you've got to do is to make it run. The section entitled *Making a program run* on page 168 explains different ways you can do so; it also tells you when you can use each method, and what are its advantages and disadvantages.
- Finally, you might like to make the program into a RISC OS application with its own icon. This makes it easier to run the program, and integrates it better into RISC OS. This relatively simple process is described in the section entitled *Making a* RISC OS *application from a 6502-based program* on page 171.

65Host and 65Tube

The Applications discs contains the two programs – 65Host and 65Tube; these enable you to run software written for the BBC Model B computer, including (using 65Tube) software designed for the 65C02 second processor. BBC Master 128 or Master Compact software may not run on an emulator if it uses facilities not available on the BBC Model B (such as shadow RAM).

- **65Host** substantially emulates a BBC Model B microcomputer, running version 1.20 of its Machine Operating System (MOS). It supports direct screen access, and paged sideways ROMs.
- **65Tube** emulates a 65C02 second processor environment.

This section gives an overview of the emulators, including the most important technical points.

Software on DFS discs

If you have previously run from an Econet network the software you now wish to run on an emulator, you can still run it in the same way from the emulator. However, much software designed for 6502-based Acorn computers is provided on discs using the DFS (Disc Filing System).

Since you cannot use DFS discs with a standard RISC OS computer (even if you have attached a 5 ¼" disc drive to it), you must first copy DFS files onto a filing system that is supported, such as ADFS or NetFS. Various third parties provide products that allow you to access DFS discs from a RISC OS computer. For full details see the section entitled *Transferring files to* RISC OS on page 165.

65Host

To start 65Host, double-click on the 65Host icon. A BBC Model B style screen will appear. You can then use the computer to run BBC Model B programs. To exit from 65Host, type `*Quit`.

Commands within 65Host

Selecting filing systems

You may select filing systems with the commands `*ADFS` and `*Net`, or one of the following:

- *ARFS selects the ARFS filing system, which accesses the current RISC OS filing system.

  Note that `*ADFS` and `*Net` set the current RISC OS filing system, and hence the ARFS filing system, to ADFS and NetFS respectively.
- *Disc selects the DFS emulation, using the current RISC OS filing system. You can then use normal DFS commands.
- *ROM selects the ROM filing system.
- *Tape cannot load or save files: it is provided in case an application issues it.

You can also access RISC OS filing systems using the command:

```
*Dir <filing system>:
```

which sets both the current emulated filesystem and the current RISC OS filing system. For example:

```
*Dir RAM:
```

selects the RISC OS RAM filing system.

Other commands

In addition, 65Host provides the following extra * Commands which you can call from within the emulation:

- *Go [*address*] branches the emulated 6502 to the specified hexadecimal address.
- *OS provides a * prompt loop within 65Host.
- *Reset [*number*] emulates a 6502 reset, like `CALL !-4`. If *number* is 1, a power-on reset is emulated.
- *Quit leaves the emulator.

Commands at the RISC OS command line

65Host also provides various commands you can use once you have run it and returned to RISC OS. Most of these are used to control the sideways ROM system.

Sideways RAM

You can if you wish create four banks of sideways RAM when you run 65Host. This is not done by default, as it uses 64KB of workspace which may not be needed. These commands operate in the same way as on the Model B+.

Limitations of 65Host

65Host cannot emulate all BBC features fully, though the limitations afflicting earlier releases have been reduced. In particular:

- Full emulation of the parallel (Centronics) printer port has been added, via the Archimedes parallel printer socket. Printing is enabled and disabled in the normal way, usually via Ctrl-B and Ctrl-C respectively.
- Full sound chip emulation has been added.

The principal limitations that still apply are as follows:

- Although access to the Network Filing System is provided (if an Econet interface is fitted), 65Host does not emulate the BBC Model B hardware, the Econet printer interface or the low level Econet `OSBYTE` and `OSWORD` calls.

  Consequently programs which run equally well from disc or Econet are unlikely to be affected by these restrictions, whereas programs written specifically for the network may well not run.
- No emulation of the serial port is provided.
- Copy-protected programs or those which attempt direct access to DFS directory sectors are unlikely to operate correctly.
- Split screen modes are not supported.

- Some problems may arise from the differing layouts of the keyboards on BBC Model B and RISC OS computers. In particular, programs that attempt to do their own Shift key processing will cause difficulties, since the key labels differ on the two keyboard layouts. Note that when the emulator is running, Break emulates the effect of the Break key on the BBC Model B, but the Reset button resets the RISC OS computer.
- Various * Commands are not provided by 65Host, principally within filing systems. These are generally not used by programs.

  Various other * Commands give slightly different output under 65Host to that they give when run on a BBC Model B. These changes are unlikely to affect the running of programs. The most noticeable differences are in commands which list the contents of directories (ie `*Cat`, `*Ex` and `*Info`) and those which give help (eg `*Help Utils`, `*Help ADFS` and `*Help Net`).
- 65Host will not work with a high resolution monochrome monitor.
- If your `Run$Path` exceeds 245 characters you may have difficulty running the emulators. Reset your `Run$Path` variable and try again.

65Tube

65Tube emulates a 65C02 second processor environment. It may be used to run many 6502 language ROM images. Some of the images are enhanced by the emulator; for example View and ViewSheet can use the Acorn 132 column display modes. However, you cannot use multiple ROM systems such as Acornsoft C, Logo or ISO-Pascal.

The emulator contains a copy of HIBASIC version 4.3, which is copied into RAM whenever `*BASIC` is executed in emulated code.

To start 65Tube, double-click on its icon. From the command line you can use the `*RMRun` command; alternatively, you may load the module with `*RMLoad`, and enter the emulator with the command `*EmulateTube`. The chapter entitled *Star command summaries*, in the RISC OS 3 *User Guide*, describes how to use the `*RMRun` and `*RMLoad` commands.

To exit from 65Tube, type `*Quit`.

Details applying to all versions

Because a 65C02 second processor contains far fewer support chips than a BBC Model B computer, the emulation provided by 65Tube is more complete than that provided by 65Host.

There are a few limitations to note; some of this information is only relevant to programmers. Don't worry if there are things you don't understand!

Extra star commands provided by the emulator

Once you have run the emulator and returned to RISC OS, you can then use the following command:

`*EmulateTube` starts up the emulator.

The emulator also provides the following extra * Command which you can call from within the emulation:

`*Quit` leaves the emulator.

The host computer

The main shortcoming of 65Tube is that there is no emulation of a 6502-based host machine; instead the emulation uses the RISC OS computer on which it is running as a host. It is as if the 65C02 second processor is connected to the RISC OS computer rather than (say) a BBC Model B computer.

This means that any program that assumes the presence of a 6502-based host is unlikely to work: for example, the software for a Level 2 file server.

Some other software may largely work, but have some parts that do not. For example, many programs written for a 6502 processor use a 6502-based host to provide sound; unfortunately the sound system on a RISC OS computer is not directly compatible.

Handling of addresses

65Tube treats addresses differently to a 65C02 second processor:

- A 65C02 second processor treats addresses from &FFFF0000 to &FFFFFFFF as addresses &0000 to &FFFF in the host computer's memory.
- 65Tube ANDs all addresses with &0000FFFF, and hence treats any address as being within the memory of its emulated second processor.

However, this is unlikely to cause you any additional problems. If a program is trying to access the host computer's memory, it's very likely that it expects the host to be 6502-based; as we've already seen, such programs are unlikely to work anyway.

Transferring files to RISC OS

Before you can try to run a 6502-based program on a RISC OS computer, you first need to be able to load the program into your RISC OS computer. In many cases this will mean transferring software from a medium that only 6502-based Acorn computers can use (such as a 5 1/4" DFS or ADFS disc) to one that RISC OS computers can use (such as a 3 1/2" ADFS disc).

There are a number of ways you can transfer files, depending on the hardware to which you have access. We outline these below.

DFS discs

DFS discs require special consideration, as they use a different naming convention from standard RISC OS filing systems. If a program running under 65Host tries to access a DFS disc, 65Host translates the filename used to one that is compatible with RISC OS naming conventions. It then uses this translated filename to get the file from the current RISC OS filing system.

Consequently, if you're transferring a DFS file to RISC OS **and intend to use it with 65Host**, you need to change its name to match that which 65Host expects. For some of the methods below this translation is automatically done for you; we tell you when this is the case. For other methods you will need to translate the filename yourself; we tell you how to do this on page 166.

If you have Econet

If you have Econet then things are easy for you. Any file you can read from an Econet file server using a 6502-based computer, you can also read using a RISC OS computer. So, you can use the file server:

- as a common storage medium for both 6502-based and RISC OS computers
- as a 'half-way house' between storage media that can only be used by one of the above types of computer.

Third party products and services

5 1/4" drives for RISC OS computers

A number of third parties have produced 5 1/4" drives for RISC OS computers, together with software to transfer files from their add-on drive to the RISC OS computer's 3 1/2" internal drive.

Some such programs will translate DFS filenames to those expected by 65Host; but you should check this by reading the manufacturer's documentation.

Serial kits

Also available from third party suppliers are serial interface kits, which allow you to transfer files from a 6502-based Acorn computer to a RISC OS computer. The kits typically consist of a special cable to connect the two computers via their serial ports, and software to control the transfer of files.

Disc transfer services

There are many companies that will transfer software for you from a 5¼" disc to a 3½" ADFS disc.

If you have a 3½" drive and a 5¼" drive for a 6502-based Acorn computer

If you have a 3½" drive and a 5¼" drive connected to a 6502-based Acorn computer, you can use these to transfer files on a 5¼" disc to a 3½" ADFS disc suitable for use with RISC OS.

In the case of DFS discs that you intend to use with 65Host, you will need to translate the filenames to those expected by 65Host.

Translating DFS filenames

65Host has a limited emulation of the disc filing system (DFS), in order to allow software to run which assumes DFS file naming conventions (ie non-hierarchical, single character qualifiers).

Note that this does not allow the direct use of 5¼" DFS format floppies, even with an appropriate disc drive and interface. Instead it uses the current RISC OS filing system with a translation applied to the filenames, as follows:

A DFS name consists of:

```
:<drive>.<qualifier>.<filename>
```

where:

- *<drive>* is one of 0, 1, 2 or 3
- *<qualifier>* is a single character, default $
- *<filename>* is at most 7 characters long.

65Host passes the name to RISC OS as:

```
<drive>.<qualifier><name>
```

So 65Host would translate a DFS name of `:2.A.Fred` to a RISC OS name of `2.AFred`.

However, certain qualifiers which are allowed on DFS (eg the default `$`), are reserved characters in RISC OS filenames, so these are replaced by other characters, as follows:

DFS character	RISC OS character
$	|
space	'
@	<
|	>
"	]
%	}
&	{
^	)

So 65Host would translate a DFS name of `:1.$.Jim` to a RISC OS name of `1.[Jim`.

Note that this scheme can lead to duplicate filenames; for example a DFS name of `:1.[.Jim` would also be translated to a RISC OS name of `1.[Jim`.

Making the translation yourself

You may have to transfer files from a DFS disc to a RISC OS medium using a method that doesn't automatically translate the filenames for you. If you wish to use the files with 65Host, you'll have to make the translation yourself. Start by setting up an ADFS disc containing directories named `0`, `1`, `2` and `3`. These directories are then used as 'drives' by the DFS emulation.

Read the first DFS file from its disc. Use the above guidelines to translate its filename, changing the character used for the qualifier if necessary. Then save the file to the appropriate directory; again, use:

0	for the first side of a disc you'd normally place in drive 0
1	for the first side of a disc you'd normally place in drive 1
2	for the second side of a disc you'd normally place in drive 0
3	for the second side of a disc you'd normally place in drive 1

Within each of these directories, a name such as `CSheila` represents the DFS file `C.Sheila`.

Accessing files using the DFS emulation

To access the files these directories contain, you must first set the current directory to be the parent of these directories.

- To do so, type `*Dir <parent directory>` after you have started 65Host, but before you enter the emulated DFS.

- Alternatively, you can make 65Host do this automatically – see the section entitled *Making a* RISC OS *application from a* 6502*-based program* on page 171.

If you try to access DFS without doing so, you will get the error message `Emulated drive not found`. This means that the emulated DFS looked in the current directory, but was unable to find the relevant subdirectory for the drive you were trying to access.

One other unexpected error you may get under DFS is `Disc not present` when, in fact, you have a disc in the drive. This means that DFS expected to find a different disc in the drive. Typically this occurs as a result of taking a disc out of the drive without first `*Dismount`ing it.

Making a program run

Once you've transferred a program to RISC OS, the next thing you've got to do is to make it run.

BASIC programs

For BASIC programs there are two possibilities you should explore:

- Running it directly under RISC OS (we call this *running native*).
- Running it by using one of the emulators.

It's far better to run native if at all possible, because you'll save yourself all the overheads of using an emulator. In other words, running native

- makes your program run faster
- saves you memory.

Other programs

Any other type of program will not run native; you'll have to use one of the emulators instead.

Alternatively, if you wrote the program yourself in a high-level language (such as C or Pascal), you can try porting the sources and recompiling them using a RISC OS compiler. It's quite likely you'll need to re-write parts of the program, particularly those dealing with input and output. You should consider converting your program to a proper RISC OS application.

Finding out if a program will run unchanged

There are two ways of finding out if a program will run unchanged:

- You can just try to run the program, and see what happens.

  The advantages of this method are that it requires no technical knowledge, and that it is quick to try.

  The disadvantage of this method is that it is hard to be certain that you have exhaustively tested all parts of the program. Even though you might think that the program runs satisfactorily, a user may later discover a particular part of the program or set of circumstances which cause it to fail.

- You can conduct a more exhaustive line-by-line investigation of the program.

  The advantage of this method is that you can be certain the program will run.

  The disadvantages of this method are that it requires technical knowledge, that it can be more time-consuming, and that you need the program's source code to do so (which you're unlikely to have unless you wrote the program yourself, or it's been written in BASIC).

Below we look at these two methods in more detail.

Trying to run an unchanged program

Running a BASIC program under RISC OS

The best way to try to run a BASIC program under RISC OS is from the command line. Because the BASIC program may crash your RISC OS computer, you should first save any other work you have done. Then leave the desktop by choosing **Exit** from the Task Manager's icon bar menu.

At the command line type

```
*BASIC
```

to enter the RISC OS BASIC interpreter. You'll find this environment very similar to the BASIC interpreter on a 6502-based Acorn computer. So, for example:

- You can change directory by typing `*DIR <directory>`.
- You can list a directory by typing `*CAT`.
- You can load a program by typing `LOAD "<program>"`.
- You can run a program you've loaded by typing `RUN`.

Use the commands you're familiar with to load and run the program you want to test.

If the program appears to work

If the program appears to work, make sure you test it thoroughly – try to use all parts of the program. If all still appears well, then you've shown the program will run native.

Now all you need to do is to make the program run from the RISC OS desktop. There are two ways of doing this:

- Set the file's type to BASIC using the command

  `*SetType <filename> BASIC`

- Make the program into a RISC OS application – see the section entitled *Making a RISC OS application from a 6502-based program* on page 171.

In both cases the program will run if you double-click on it; however, the latter method is preferable, and easy to do.

If the program doesn't work

If the program doesn't work you can either give up trying to make it run native, or you can modify it until it does run.

One of the most common problems is a program that uses DFS; RISC OS does not support this now obsolete filing system. You have two choices here:

- Convert the program to use another filing system, such as ADFS or NetFS.

  Because DFS uses a different naming convention to the standard RISC OS filing systems, you may find discrepancies between any filenames the program uses, and the names that the files actually have. If this occurs, you will have to make the filenames match each other.

- Give up trying to make the program run native; instead run the program under 65Host, using its emulation of DFS.

  Under RISC OS you can list and edit lines of a BASIC program in the same way as on a 6502-based Acorn computer.

Running any program under one of the emulators

To try running any program under one of the emulators you first need to start the relevant emulator. Because the program may crash your RISC OS computer, you should first save any other work you have done. Then double-click on the emulator's icon from within the RISC OS desktop.

Once the emulator's started you'll find almost everything just as you're used to on a 6502-based Acorn computer. Try running the program in just the way you usually do.

If the program appears to work

If the program appears to work, make sure you test it thoroughly – try to use all parts of the program. If all still appears well, then you've shown the program will run under the emulator.

There are two ways you can run the program in future:

- Run it just as you've done now.
- Make the program into a RISC OS application – see the section entitled *Making a RISC OS application from a 6502-based program* on page 171.

In the latter case the program will automatically run under the emulator if you double click on the application's icon.

If the program doesn't work

If the program doesn't work you'll only be able to get it to do so by modifying it. See the next section.

Checking through a program for problems

There are two reasons why you might wish to check through a program for potential problems:

- You know the program won't run, and wish to find out why
- You wish to be methodical in ensuring that the program will run.

How much checking you can do (and how easy it will be to correct any problems) depends largely on how the program was written, and whether you've got the program's source code available:

- If the program wasn't written in BASIC and you haven't got its source code available, you won't be able to do much to check it. All you can do is try to run it, and see what happens. See the previous section, entitled *Running any program under one of the emulators*.
- If the program wasn't written in BASIC but you've got its source code available, you'll be able to check it.
- If the program was written in BASIC you'll be able to check it.

Making a RISC OS application from a 6502-based program

This section tells you how to take a program originally written to run on a 6502-based Acorn computer, and 'bundle' it up to convert it into a RISC OS application. Before you can do this:

- you need to be sure that the program will run, as outlined in the section entitled *Making a program run*.
- you need to know if you can run the program directly under RISC OS (we say it 'runs native'), or if instead you need to use 65Host – again this is outlined in the section entitled *Making a program run*.

By following the relevant process we outline below, you'll end up with an icon that you can treat just like any other RISC OS application. So, for example:

- You can run your application by double-clicking on its icon.

  If the program runs native, then RISC OS will load and run it. If instead the program needs to use 65Host, then RISC OS will automatically start up 65Host before loading and running the program.
- You can copy your application by dragging it from one directory display to another – even if they're on different filing systems.

  You might, for example, use this method to put a copy of your application on an Econet file server.

The structure of a RISC OS application

In order to understand fully how to create a RISC OS application, you'll need to know a little of how one works.

An application is a directory, the name of which starts with a '!' (often pronounced pling) character. Because of this, it's treated differently from a normal directory.

When RISC OS first 'sees' an application

When RISC OS first 'sees' an application (ie when you first open the directory display that contains the application), it looks inside the application for a file called `!Boot`. (Remember, an application is just a special type of directory.) If the file exists, RISC OS runs it.

Typical uses of this file include

- setting up icons for the application, and for any new file types it provides
- letting RISC OS know where the application is stored, and what it can do.

For example, the PrintEdit applications' `!Boot` file

- sets up large and small icons for itself
- tells RISC OS how to get PrintEdit to load a Print definition file if you double-click on one
- defines the name of PrntDfn file type to be FC6.

If there's no `!Boot` file inside the application, RISC OS then looks for a file named `!Sprites`. It's this file that actually holds the application's icons. If the file exists, RISC OS automatically sets up the icons.

If, after all this, there's still no icon set up for the application, RISC OS uses the default application icon – an Archimedes logo with the word `APP` in its top left corner.

When you run an application

When you run an application (ie when you double-click on its icon), RISC OS looks for and runs a file inside the application called `!Run`. This file must be present; if it's not, you'll get an error message. The job of the `!Run` file is to get the application running. This might involve loading modules into memory, declaring how much memory is needed, setting system variables and so on. It could, however, be as simple as a single * Command.

An application's `!Run` file is almost always a special form of command file called an Obey file. When an Obey file is run each of its lines is passed to the Command Line Interpreter, just as if you had typed the line at the * prompt.

Opening an application directory

When you double-click on a directory, RISC OS opens a window to show its contents. To open an application and see the files it contains, you can't just double-click, because this runs the application. Instead you need to hold down the **Shift** key while you double-click on the application's icon. If you try this with the applications supplied with RISC OS (such as 65Host) you will see they contain several files – including the `!Boot`, `!Run` and `!Sprites` files to which we've already referred. Sometimes you will see that an application has subdirectories inside itself.

Using a program that needs to use 65Host

You should now have enough information to create a RISC OS application from a program that needs to use 65Host to run. When you run the application, RISC OS will automatically start up 65Host before loading and running the program. Because such an application is run as if it's on a 6502-based computer, we call it a 6502 application.

The example

In this section we'll take you through the process with a typical example of a DFS disc. The disc contains a simple BASIC program called `HelloW`, and a file called `!Boot` that starts the program running. In common with most DFS discs, a user can start running the program by putting the disc in the drive, holding down the Shift key and pressing Break.

Make 65Host available to the application

Using the RISC OS desktop, format a 3½" disc. Copy 65Host from your applications disc to your new disc's root directory.

Create and open an application directory

Create a new directory in your new disc's root directory. Its name must start with a '!' character to show it's an application. In this example, we'll call the application `!HelloW`. Because there's nothing yet inside the application directory to set up an icon, RISC OS will use its default icon for applications.

Open the application directory by holding down the Shift key while you double-click on its icon.

Create and open a subdirectory to hold the DFS disc's contents

Create a new directory named `6502Disc` in the `!HelloW` application directory (which you just opened). This directory will hold the same files that you'd normally find on a disc for use with a 6502-based Acorn computer.

Open the `6502Disc` directory by double-clicking on it.

Copy the DFS disc's contents to the subdirectory

Open the **HelloWDisc** directory in the **65Examples** directory within the Tutorials directory (on Applications disc 2) which contains a copy of the files on our example DFS disc. Copy the files in this directory to the 6502Disc directory you just created.

Create the application's !Run file

From Edit's icon bar menu move to the Create submenu, and choose **Obey**. Type in the following Obey file:

```
Dir <Obey$Dir>.6502Disc
Run <65Host$Dir>.!Run &B03 !BOOT
```

- The first line sets the current directory to be the `6502Disc` directory, which holds both the program and its associated `!Boot file`.
- The second line starts 65Host by running its `!Run` file. 65Host then uses boot option &B03 to load and run the application's `!Boot` file.

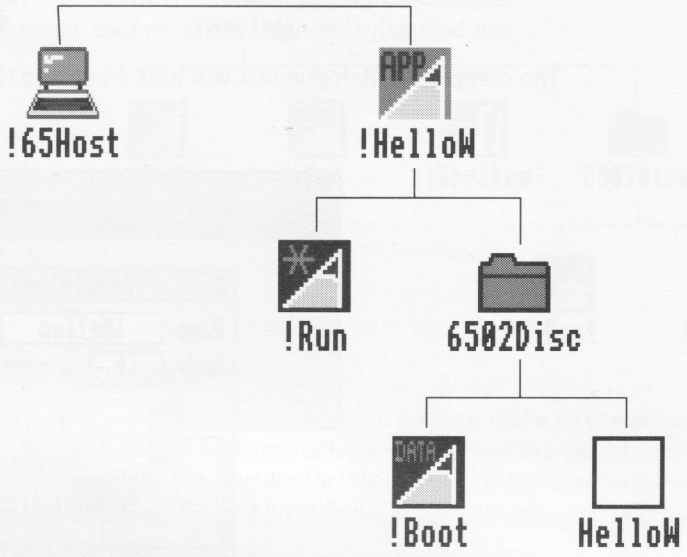
Save the file as `!Run` in the `!HelloW` application directory.

The filing system on which 65Host looks for `!Boot` is controlled by the first hex digit of the boot option. In this case it is 'B', which makes 65Host use the current RISC OS filing system. This is the option you'll normally want to use, so you can freely move the application between filing systems.

The last two hex digits control how 65Host runs !Boot. They exactly correspond to the numbers used with the `*Opt 4` command. In this case they are '03', so 65Host runs `!Boot` using the `*EXEC` command.

Running the application

You should now have the following file structure on your floppy disc:



You've now done enough for the application to run. If you double-click on the `!HelloW` application icon then the BASIC program `HelloW` will be run under 6502 Emulation.

Type `*QUIT` at the emulator's '>' prompt to return to the RISC OS desktop.

Giving the application its own icon

One extra thing you might want to do is to give your application its own icon. You can easily do this using Paint. If you haven't already loaded a copy of Paint, do so now.

Creating the icon

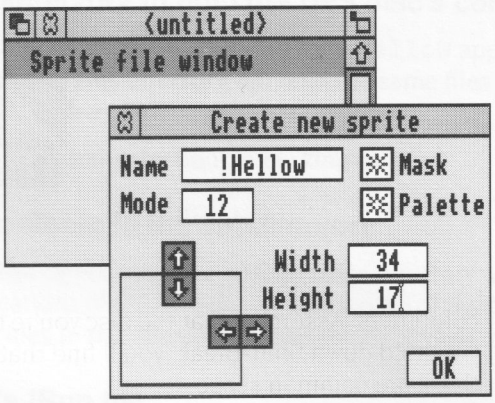
You must create the icon in Mode 12, which you should select using the palette's icon bar menu.

Open a new sprite window by clicking on the Paint icon. Create a new sprite using the Create submenu, as follows:

- The name of the sprite must be the same as that of the application, including the '`!`', but in lower case throughout. So for `!HelloW` the sprite must be called `!hellow`.

- The sprite **should** be 34 pixels wide (although it can be as wide as 50 pixels if absolutely necessary), and **must** be 17 pixels high.
- The sprite should have a mask.
  This is because applications' icons should have an irregular outline, so they can be easily distinguished from files' icons (which are normally square).

The completed dialogue box will look similar to this:



Now use Paint to design your sprite. When you have finished, save your sprite as a file called `!Sprites` within the `!HelloW` application directory.

An example sprite is available as **!Sprites** in the **65examples** directory.

Adding a !Boot file to the application

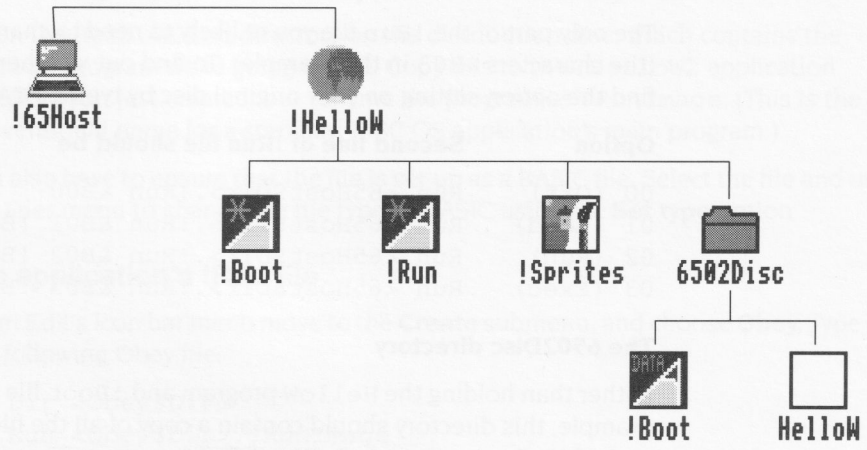
Now when your application is 'seen' on the desktop your sprite will be used for its icon. RISC OS does this automatically; however, to be correct you should create a `!Boot` file for the application that sets up the icon. Like the `!Run` file you created earlier, this should be an Obey file.

From Edit's icon bar menu move to the **Create** submenu, and choose **Obey**. Type in the following Obey file:

```
IconSprites <Obey$Dir>.!Sprites
```

Save it as `!Boot` in the `!HelloW` application directory (ie with the `6502Disc` directory, and the `!Run` and `!Sprites` files):

Of course, your icon for `!HelloW` will differ from that below.



Creating other '6502 applications'

In this section, we'll look at any changes you'll have to make to the above procedure to 'bundle up' the contents of other discs for 6502-based Acorn computers. Assuming that the disc you're transferring is one that auto-boots when you hold down Shift-Break, you'll find that there are few changes, and most of these are common sense.

You may find it quicker to start with a copy of the `!HelloW` disc you just made, and adapt it to what's needed for your new application.

!65Host

The 65Host application must be present for you to run other applications that use it. You may put several applications on one disc, each in their own application directory; if you do so you still only need the one copy of 65Host on that disc.

The application directory

Other applications must obviously have a name other than `!HelloW`. You should never have two applications with the same name; even if it doesn't confuse you, it may confuse RISC OS.

The !Boot and !Sprites files

If you decide to define icons for other applications, you do so just as you did for `!HelloW`. Make sure any sprites you create have the same name as the corresponding application. The accompanying `!Boot` file should be exactly the same as the one we used with HelloW.

The !Run file

The only part of the `!Run` file you're likely to need to change is the boot option (the characters `&B03` in the example). To find out whether you need to change it, find the option setting on your original disc by typing `*CAT`:

Option	Second line of !Run file should be
`00 (Off)`	`Run <65Host$Dir>.!Run &B00`
`01 (Load)`	`Run <65Host$Dir>.!Run &B01 !BOOT`
`02 (Run)`	`Run <65Host$Dir>.!Run &B02 !BOOT`
`03 (Exec)`	`Run <65Host$Dir>.!Run &B03 !BOOT`

The 6502Disc directory

Rather than holding the `HelloW` program and `!Boot` file we created in the earlier example, this directory should contain a copy of all the files you transferred from your 6502 disc or network directory.

Using a BASIC program that runs native

If a BASIC program will run native, it's a little easier to make it into a RISC OS application. The process is very similar to that for a program that needs to use 65Host, but with some omissions.

The example

Again, we'll take you through an example before giving more general notes on how to adapt the example for use with other programs. We'll use the same `HelloW` program as our example so you can easily see the differences between a program that is running native and one that is running under the emulator.

Create and open an application directory

Format a new disc and create a new directory in its root directory. The directory's name must start with a '`!`' character to show it's an application. In this example, we'll call the application `!HelloW2`. Because there's nothing inside the application directory to set up an icon, RISC OS will use its default icon for applications.

Open the application directory by holding down the Shift key while you double-click on its icon.

Copy the BASIC program into the application directory

Open the `HelloWDisc` directory on the distribution disc, which contains the `HelloW` program we're going to use. Copy this to the `!HelloW2` application directory you just created, but rename the program as `!RunImage`. (This is the conventional name for a standard RISC OS application's main program.)

You also have to ensure that the file is set up as a BASIC file. Select the file and use the Filer menu to change the file type to BASIC using the **Set type** option.

Create the application's !Run file

From Edit's icon bar menu move to the **Create** submenu, and choose **Obey**. Type in the following Obey file:

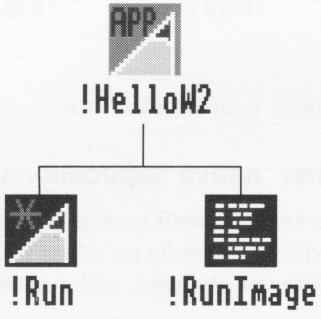
```
Dir <Obey$Dir>
Run <Obey$Dir>.!RunImage
```

- The first line sets the current directory to be the application directory, which holds the program. `<Obey$Dir>` is a system variable which holds the pathname of the Obey file being executed.
- The second line runs the program named `!RunImage`, which is our BASIC program.

Save the file as `!Run` in the `!HelloW2` application directory (ie with the `!RunImage` file).

Running the application

You should now have the following file structure on your floppy disc:



You've now done enough for the application to run. If you double-click on the `!HelloW2` application icon then the BASIC program `!RunImage` will be run.

Giving !HelloW2 its own icon

Make an icon for !HelloW2, as described earlier for the 65Host program !HelloW. Remember to name the sprite after the application, i.e. `HelloW2`.

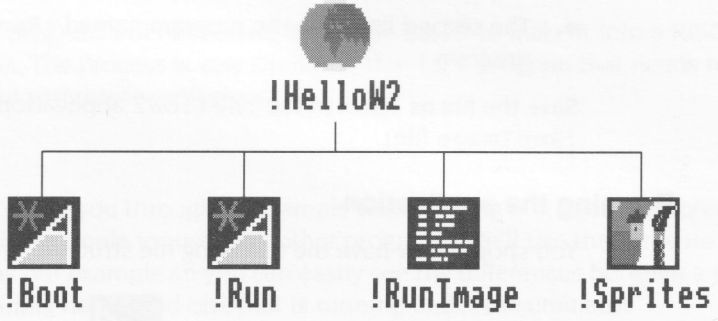
Adding a !Boot file to the application

Now when your application is 'seen' on the desktop your sprite will be used for its icon. RISC OS does this automatically; however, to be absolutely correct you should create a `!Boot` file for the application that sets up the icon. Like the `!Run` file you created earlier, this should be an Obey file.

From Edit's icon bar menu move to the **Create** submenu, and choose **Obey**. Type in the following Obey file:

```
IconSprites <Obey$Dir>.!Sprites
```

Save it as `!Boot` in the `!HelloW2` application directory (ie with the `!Run`, `!RunImage` and `!Sprites` files):



Of course, your icon for `!HelloW2` will differ from that above.

Creating other 'native applications'

In this section, we'll look at any changes you'll have to make to the above procedure to 'bundle up' other BASIC programs that will run native. You'll find that there are few changes, and most of these are common sense.

You may find it quicker to start with a copy of the `!HelloW2` disc you just made, and adapt it to what's needed for your new application.

The application directory

Other applications must obviously have a name other than `!HelloW2`. You should never have two applications with the same name; even if it doesn't confuse you, it may confuse RISC OS.

The !Boot and !Sprites files

If you decide to define icons for other applications, you do so just as you did for `!HelloW2`. Make sure any sprites you create have the same name as the corresponding application. The accompanying `!Boot` file should be exactly the same as the one we used with HelloW2.

The !Run file

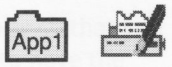
The `!Run` file should be exactly the same as the one we used with HelloW2.

The !RunImage file

Change the `!RunImage` file to be a copy of the file you want to run.

Part 3: Utilities

12 PrintEdit



This chapter provides an introduction to PrintEdit, an application which enables experienced users to edit existing printer definition files and experts to create them from scratch. Printer definition files are used by the Printer manager application !Printers.

Less experienced users may wish to modify an existing printer definition file when supplied with step-by-step instructions provided by an expert. Such instructions might be issued, for example, by Acorn or another printer supplier. The instructions should list the exact operations needed to be performed in each PrintEdit window. You will not need a full understanding of the features of PrintEdit.

Creating printer definition files is technically very complex and requires a deep understanding of how printers work. It is beyond the scope of this chapter to provide such an understanding. For more details about creating printer definition files, see the RISC OS *Programmer's Reference Manual*.

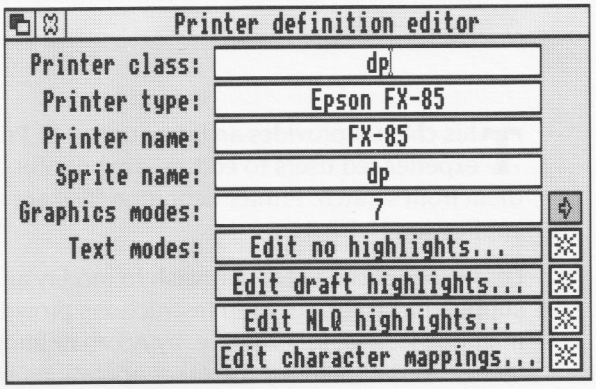
Before you can use PrintEdit you should

- have the user guide and technical manual for your printer
- or have some step-by-step instructions from an expert.

Most people will use PrintEdit to alter one of the existing printer definition file configurations, rather than make up a completely new one. So we shall use the printer definition file for the Epson FX85 as an example.

Start the application by double-clicking on the PrintEdit icon. This displays the PrintEdit window. Drag an existing printer definition file to this window to load it for alteration. Alternatively you can start PrintEdit with an existing printer driver loaded by double-clicking on one of the printer definition files contained in the Printers directory (on App 2).

The appearance of the PrintEdit window when the Epson FX85 definition file is loaded is as follows:



The **Printer class** represents a type of printer: **dp** for dot matrix and other bit-image printers and **lj** for HP LaserJet compatibles. This application cannot be used for defining PostScript printers.

Printer type is the full name of the printer.

Printer name is the name you want to appear underneath the printer on the icon bar. The name can be up to 10 characters long.

Sprite name is the sprite to be used as the printer icon on the icon bar. These can again be **dp** for dot matrix and other bit-image printers and **lj** for HP LaserJet compatibles. You can also define your own sprites for this icon.

Graphics modes defines the number of graphics modes your printer can use. Find this information out from your printer manual.

Text modes defines the type of text modes your printer can use. Find this information out from your printer manual.

Edit no highlights defines the simplest print options of plain text only.

Edit draft highlights includes all the standard highlights such as bold, italic, superscript and subscript in draft mode.

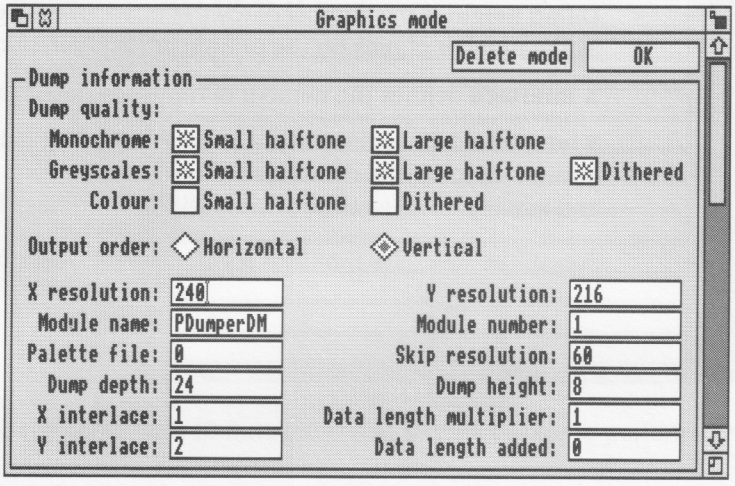
Edit NLQ highlights is the same as Edit draft highlights but for the NLQ (Near Letter Quality) mode.

Edit character mappings allows a character from the Acorn character set to be converted to the same character in the printer's character set.

For the rest of this chapter you should have your printer manual ready so that you can look up the information required by PrintEdit. It may also help to have the Help application active, as this will give you quick summaries of each field in the dialogue boxes.

Graphics mode

Display the Graphics modes dialogue box by clicking on the right arrow by the **Graphics modes** entry. Choose an existing resolution to edit or **New resolution** if you want to start afresh. In most cases it is probably easier to edit an existing file and tailor it to your needs. Here is the Graphics mode window for the Epson at a resolution of 240 by 216.



Dump information

The first part of the window gives the **Dump information** – the information the printer uses to print correctly.

The **Dump quality** boxes should normally all be ticked, as the software supports these features on all printers. However, don't tick the colour options unless you have a colour printer.

Output order defines how the image is printed. Most printers, like the Epson, use **Vertical**. Some, like the Integrex, use **Horizontal**.

X and **Y resolution** define the graphics resolution in dots per inch. These will be defined in your printer manual, but may be given in different units.

Module name and **Module number** define the dumper files used by the printer. These are currently two dumper files, although more can be defined if needed.

`PDumperDM` has the Module number 1 and is for dot-matrix and other bit-image printers.

`PDumperLJ` has the Module number 2 and is for HP LaserJet compatible printers.

Palette file defines the Palette file – this is currently always set to zero.

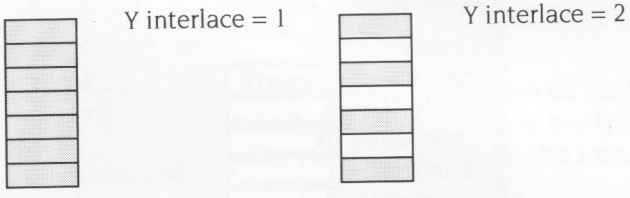
Skip resolution defines the leading zero skip resolution of the dump. This is always 60 for Epson printers and 120 for IBM printers.

Dump depth is the depth of one pass of the head in pixels.

Dump height is the number of rows of pixels in each vertical pass. This is the same as the number of pins on the print head; a 24 pin printer would print 24 dots.

X interlace defines the number of times the data is sent to the printer.

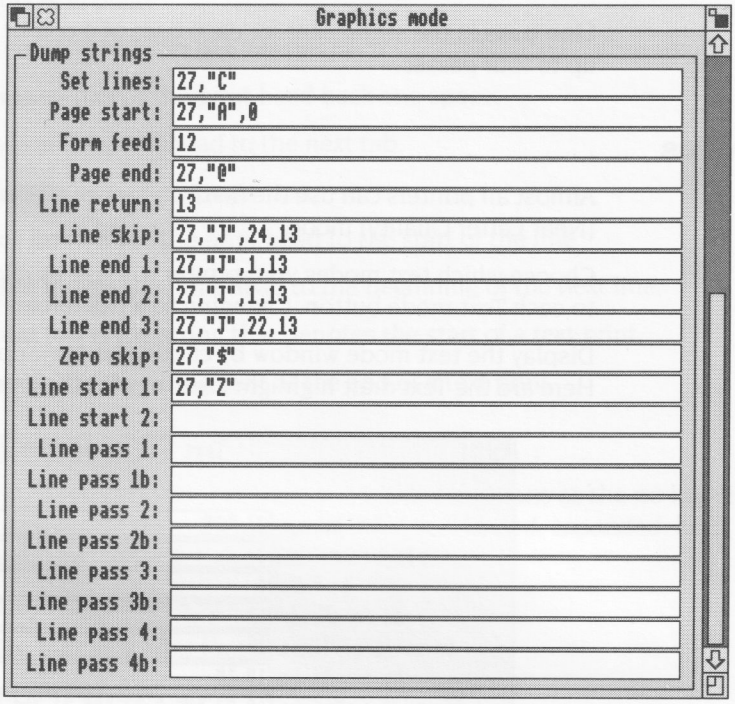
Y interlace defines the vertical step for obtaining data for each line sent by the X interlace loop. The driver scans horizontally across the image, dumping the data and moving down a single pixel until the Y interlace is zero.



Data length multiplier and **Data length added**. For Epson printers, you specify a line of graphics by saying '<27><42><0><number of columns>'. For IBM printers, you need '<27>|g<number of columns times 6 (or 3) plus 1><graphics mode>'. So, for Epson printers, the Data length multiplier is 1 and Data length added is 0. For IBM printers, Data length multiplier is either 6 or 3, and Data length added is 1.

Dump strings

The second part of the window gives the Dump strings.



These are the codes sent to the printer that tell the printer to perform certain actions.

Set lines is the string set to define the number of lines per page.

Page start is the string sent at the start of a page.

Form feed is the form feed character.

Page end is the string sent at the end of each page.

Line return moves the print head to the beginning of the line.

Line skip moves the print head to the beginning of the next line.

Line end 1 to **Line end 3** are the strings sent at the end of each line pass. There can be up to three passes.

Zero skip is issued to skip leading zeros.

Line start is the string sent at the beginning of a graphics line. For Epson printers, **Line start 2** is not needed. For IBM printers, **Line start 2** must be '<graphics mode>', while **Line start 1** is '<27>|g'.

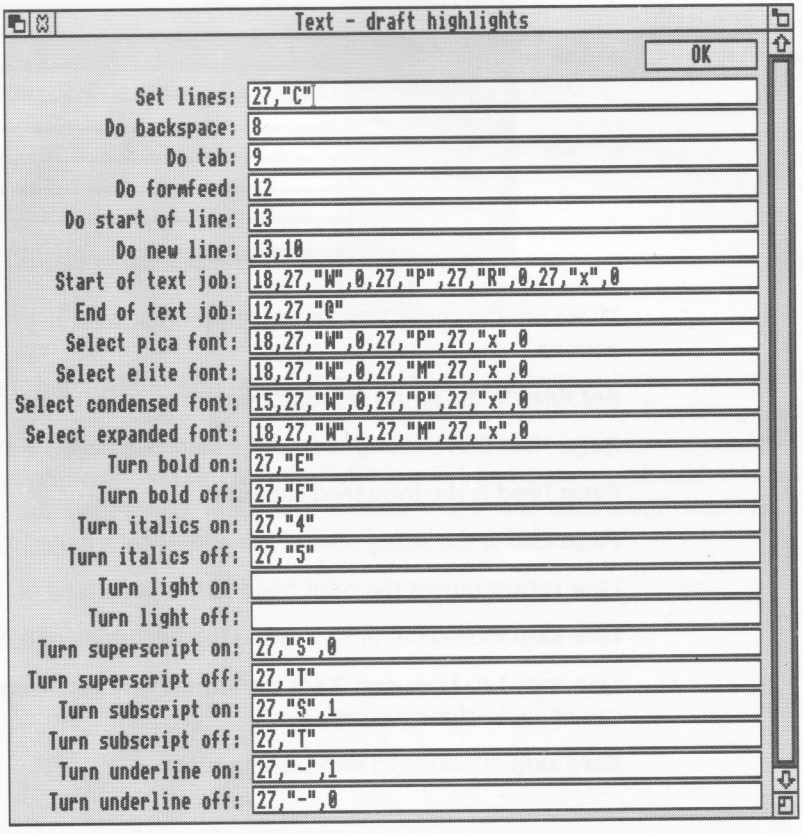
Line pass is the string sent for each pass of a colour graphics dump. There can be up to four passes.

Text modes

Almost all printers can use the first two text modes and many also support an NLQ (Near Letter Quality) mode.

Choose which text modes your printer will use by clicking on the cross or tick next to each Text mode button. Changing to a tick allows you to select that mode.

Display the text mode window by clicking on the appropriate text mode button. Here are the Text draft highlights settings for the Epson FX85.



Edit no highlights

The no highlights mode is a very simple mode without any special effects, so most of this window is blank.

Set lines sets the number of lines per page.

Do backspace moves the print head back one space.

Do tab moves the print head to the next tab.

Do formfeed starts a new page.

Do start of line moves the print head to the start of the line.

Do new line moves the print head to the beginning of the next line.

Start of text job is the string that denotes the start of a text print.

End of text job is the string sent at the end of a text print.

Edit draft highlights

The draft highlights mode uses the same basic definitions as the no highlights mode, but expands this to include pica, elite, condensed, expanded, bold, italics, light, superscript, subscript and underline printing.

Select pica font sets pica font (10 cpi).

Select elite font sets elite font (12 cpi).

Select condensed font sets condensed font (17cpi).

Select expanded font sets expanded font (6 cpi).

Turn bold on sets bold text on.

Turn bold off sets bold text off.

Turn italics on sets italic text on.

Turn italics off sets italic text off.

Turn light on sets light text on.

Turn light off sets light text off.

Turn superscript on sets superscript text on.

Turn superscript off sets superscript text off.

Turn subscript on sets subscript text on.

Turn subscript off sets subscript text off.

Turn underline on sets underline text on.

Turn underline off sets underline text off.

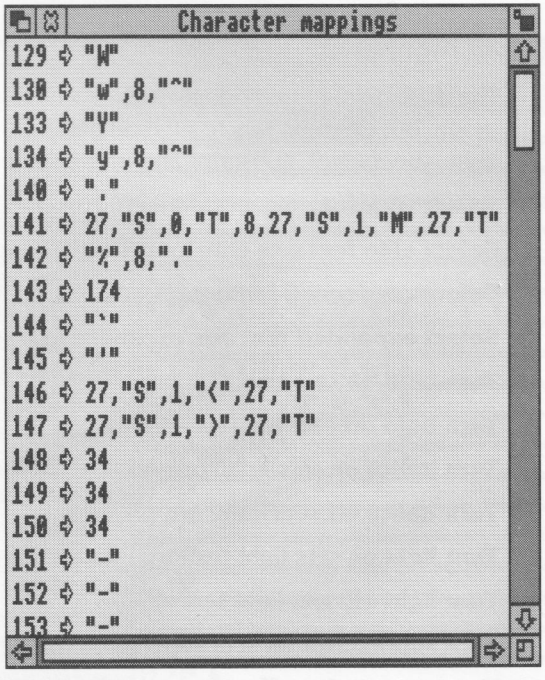
Edit NLQ highlights

The NLQ highlights mode uses the same basic definitions as the draft highlights mode, but alters these to enable the printer's NLQ operation.

Edit character mappings

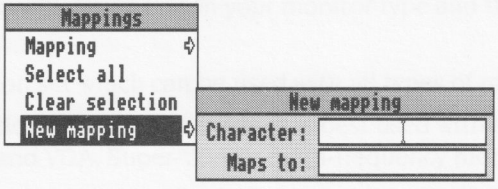
Edit character mappings allows a character from the Acorn character set to be converted to the same character in the printer's character set. Although all the standard characters normally map directly onto the corresponding printer characters, the top-bit-set characters normally need mapping from Acorn's character set to the printer's character set.

Mapping is done from the Edit character mappings window. Here is part of the Epson FX85's character mappings.



The number down the left column represents the Acorn character in decimal, while the string to the right of the arrow represents the commands to send to the printer that reproduce the same character.

To enter a mapping, press Menu to display the **Mappings** menu. Go to the **New mapping** dialogue box and type in the Acorn character to map in the **Character** box. You can type in the Acorn character directly from the keyboard, by using the Chars application or by using its decimal character code. Type the printer commands that produce the same character in the **Maps to** box. Press Return to add the mapping to the list.



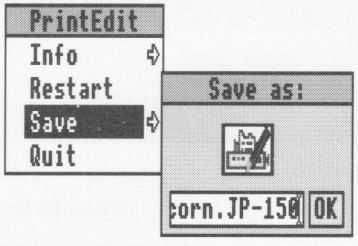
You can edit and delete current mappings in a similar way by using the **Mapping** option.

Saving and quitting

When you have finished making changes to your the printer definition file, save the modified file by clicking Menu over the main Printer Definition editor window and choosing **Save**.

If you wan to discard any changes you have made and start again click on **Restart**.

To finish using the application, chose **Quit**.



13 SetIcons

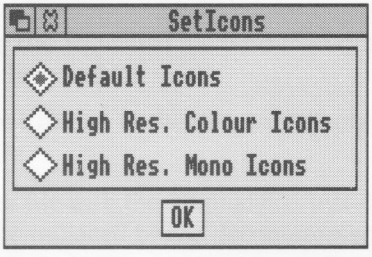
There are, in fact, **three** different sets of icons available. Which ones you can use for your desktop will depend upon your monitor type and the screen modes you use. These are:

- the standard icon set which can be used with all types of monitors
- the high definition colour icon set which is best used with the high-resolution screen modes and VGA, Super-VGA or multi-frequency monitors
- the monochrome icon set that looks best when used with high-resolution monochrome monitors in mode 23.

The application **SetIcons** is used to define which set of icons to display on the desktop.

If you were supplied with a single Applications disc you will find this application in the root directory. If you were supplied with two Applications discs you will find this application on App1.

Double-click on the SetIcons application and the SetIcons dialogue box is displayed.



To choose an alternative set of icons:

1 Click on the icon type you want to use.

2 Click on the **OK** box. This redraws the screen with the icons you selected.

3 Finish using the application, by clicking on the window's Close icon.

How SetIcons operates

When you click on **OK**, SetIcons automatically generates an internal boot file that tells RISC OS to use the icon set you specified.

When you switch on or reset your computer, the computer uses the standard icon set **until** it sees the !SetIcons application in a directory display. When it sees the application, it changes to the icon set you previously defined. So, for SetIcons to operate it must be in a directory display that is displayed on screen.

Memory usage

SetIcons can use up a significant amount of free memory, up to 60KB. If you need this extra memory for running applications, do not use SetIcons.

14 Squash

Squash is a simple application that compresses files and directories. Compression means that they take up less disc space, enabling more files to be fitted onto a floppy or hard disc.

To use Squash, double-click on the **Squash** icon in the directory display. This installs Squash on the icon bar.

Compressing a file

To compress a file, drag the file icon onto the Squash icon on the icon bar. This displays the Squash Save as box.

Drag the icon from the Save as box to the directory display in which you want to save the compressed file.

Alternatively, if you want to replace the original file with the compressed version of the file, just click on the Save as **OK** box instead.

Decompressing a file

To decompress a file, drag the Squashed file onto the Squash icon on the icon bar. This displays the squash Save as box.

Drag the icon from the Save as box to the directory display in which you want to save the decompressed file.

To replace the compressed file with the original file, just double-click on the Squashed file and it will be replaced by the decompressed file.

Compressing directories and applications

To compress a directory or application, drag the directory or application onto the Squash icon on the icon bar. This displays the Save as box with two options, **Squash** and **Unsquash**.

Clicking on **Squash** will compress the entire contents of the directory or application.

Drag the icon from the Save as box to the directory display in which you want to save the compressed directory or application.

Alternatively, if you want to replace the original directory or application with the compressed version, just click on the Save as **OK** box instead.

Decompressing a directory or application

To decompress a directory or application, drag the Squashed directory or application onto the Squash icon on the icon bar. This displays the Squash Save as box with two options, **Squash** and **Unsquash**.

Clicking on **Unsquash** will decompress the entire contents of the directory or application.

Drag the icon from the Save as box to the directory display in which you want to save the decompressed directory or application.

To replace the compressed directory or application with the decompressed version, just double-click on the Squashed file and it will be replaced by the decompressed version.

Icon bar menu

Info

This gives you information about the application.

Save box

When the Save box is ticked (normally) each compression (or decompression) prompts you with a Save as box. If you are converting a large number of files, you can use this option to turn off the Save box. Turning off the Save box allows all files and directories to overwrite the original versions during the conversion process.

Squash Apps

This option toggles the compression of applications. This is Off by default; Squash will not compress applications it finds in subdirectories.

Applications that are dragged to the Squash icon will always be compressed.

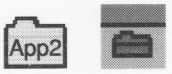
Quit

Quit ends the Squash application, removing the Squash icon from the icon bar.

Checking your archive

As with any archival mechanism, the user should check that they can correctly compress and decompress back to the original size any information which is valuable or difficult to replace.

15 TinyDirs



TinyDirs allows you to keep files and directories – including applications – on the icon bar for rapid access; this is particularly convenient when you are working with several objects but do not want to keep them all on the screen. It works in much the same way as Pinboard; however icons are restricted to the icon bar.

Note: TinyDirs has been superseded by Pinboard, and is included in RISC OS 3 *for backwards compatibility only. Pinboard is described in the* RISC OS 3 *User Guide.*

Starting TinyDirs

To start TinyDirs:

1 Display the directory display that contains !TinyDirs.

2 Double click on !TinyDirs.

A directory icon will appear on the icon bar, the TinyDirs icon.

File manipulations using TinyDirs

Adding TinyDirs icons

You can now drag one or more objects from a directory display to the TinyDirs icon; each object is represented by the appropriate icon with the name of the object beneath it. Further objects can be moved to the icon bar by dragging them onto any TinyDirs icon already there.

Double-clicking

Double-clicking on a TinyDirs icon has the same effect as double-clicking on it in its normal directory display: directories are opened, data files are loaded into the appropriate editor, and applications are run. A double click using Adjust instead of Select carries out the same action, but at the same time removes the TinyDirs icon from the icon bar.

Unlike an application installed on the icon bar in the normal way (which is running even if you are not actually using it), an application placed on the icon bar using TinyDirs is not run until you double-click on it.

Opening an application

As with application directories in a directory display, you can open the application directory by holding down Shift when you double-click on the application.

Loading a file

To load a file onto a TinyDirs application, hold Ctrl and drag the file onto the application's TinyDirs icon; this will run the application and load the file into it.

Dragging TinyDirs icons

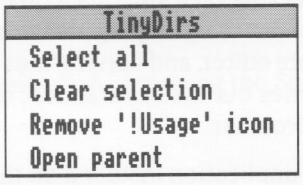
TinyDirs icons can be dragged from the icon bar to the following destinations:

Drag destination	Action
A Filer window	Files are copied to the window
A non-Filer window	Files are inserted in the window if applicable
A non-TinyDirs icon on the icon bar	Selection is loaded into application if applicable
An empty part of the icon bar	Any applications are run; other types are ignored

Displaying the TinyDirs menu options

Pressing Menu on any TinyDirs icon displays a menu with four options. Use the following table to decide which menu option you need to carry out a particular task:

Task	Option
Select all TinyDirs icons	Select all
Deselect icons	Clear selection
Remove a selected icon from TinyDirs	Remove icon
Open the directory display containing the icon	Open parent



Select all

Click on **Select all** to select all the TinyDirs icons currently on the icon bar.

Clear selection

Click on **Clear selection** to deselect any currently selected TinyDirs icons.

Remove icon/Remove selected icons

Click on **Remove icon** to remove the selected TinyDirs icon from the icon bar. If more than one object is selected, this menu option reads **Remove selected icons**.

Open parent

Click on **Open parent** to open a display for a directory's parent directory; if the selected icon is a file, it opens a directory display for the directory containing the file. If more than one object is selected, this option is not available.

Quitting TinyDirs

To quit TinyDirs, remove all the directories and files as described above; this will leave you with a directory icon with no name beneath it. Pressing Menu now produces a directory containing just two options.

Info gives the usual information about the application.

Quit removes the empty TinyDirs icon from the icon bar.

Saving the TinyDirs configuration in a desktop boot file

TinyDirs can use the desktop boot facility in the Task manager. If you have applications loaded onto TinyDirs when you save your boot file, that information will be stored in the boot file, so that not only will TinyDirs be loaded when you run the boot file, but those applications will be loaded onto it too.

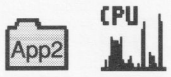
If you wish to create your own boot file or to edit an existing boot file, TinyDirs uses the following command:

```
AddTinyDir pathname
```

This adds a TinyDirs icon to the icon bar. For example:

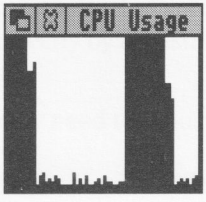
```
AddTinyDir ADFS::4.$.app.!Clock
```

16 Usage



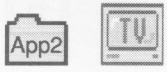
The Usage utility is a tool which displays the proportion of CPU usage (how busy the processor is) with time.

To display CPU usage, double-click on the Usage icon from the appropriate directory display. A window of fixed size appears, displaying a horizontally-scrolling graph indicating the percentage of CPU usage.



When you have finished using the application, click on the window's Close icon.

17 TVTest



TVTest is a small application that helps you set up your monitor or television for use with your computer. TVTest only operates with standard TV type monitors and televisions (type 0), and Multi-frequency monitors (type 1).

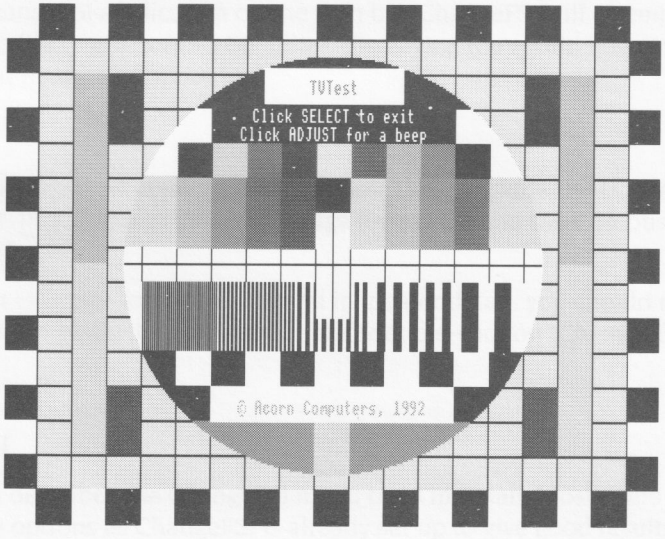
Using TVTest

Start the TVTest application by double-clicking on the TVTest icon in the applications directory display. The screen changes to show the test card. Use the test card to set up your screen correctly by adjusting your monitor or television until the best picture is obtained.

If you are using a television you may need to adjust the channel frequency to tune in the test card correctly.

Testing sound

If you are using a television with a computer which allows sound to be played through the television loudspeaker, you can check whether the sound will interfere with the picture by clicking on Adjust. This plays a beep, and you may need to adjust your television further if it does cause interference.



When you have finished adjusting the picture, click Select to return to the desktop.

18 ChangeFSI

ChangeFSI is a useful program for converting and displaying image files of various formats. These images can then be converted into sprites for viewing with RISC OS applications such as !Paint.

In case you're wondering, ChangeFSI stands for 'Change Floyd Steinberg Integer' (ChangeFSI performs Floyd Steinberg error diffusion dithering).

You should make sure that your conversion and subsequent use of an image does not infringe on any copyright that the image may be under.

ChangeFSI provides the ability to read, scale the data to improve the picture, change the x and/or y size, sharpen the picture and write the result using error diffusion dithering in one step (so it provides the best possible quality). All operations are carried out with 32-bit fixed point numbers (three per pixel in the case of a colour picture).

Using ChangeFSI

Double click on the application to start ChangeFSI. Its icon will be loaded onto the icon bar. Display the file icon for the image you wish to process, and drag the icon onto the ChangeFSI application on the icon bar. ChangeFSI will attempt to interpret the file to give a RISC OS sprite, displaying the result. You can then save the resultant image as a sprite file.

Picture formats

ChangeFSI will convert many types of images. These include the PC graphics formats TIFF, PCX, PIC and IMG, the Amiga format IFF and the Compuserv GIF format.

For a full list of image formats explained in greater detail, you should read the file FSI*Info* provided inside the application (shift double-click on !ChangeFSI to display the files).

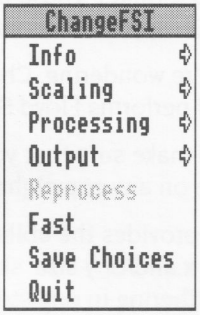
ChangeFSI in more detail

This section describes the ChangeFSI menu trees in detail. Most users won't need to use these options as ChangeFSI is already set up to give good results with most types of image files.

If you want to know how ChangeFSI and its options are used in greater detail you should read the information file, FSII*nfo*, provided inside the application (shift double-click on !ChangeFSI to display the files).

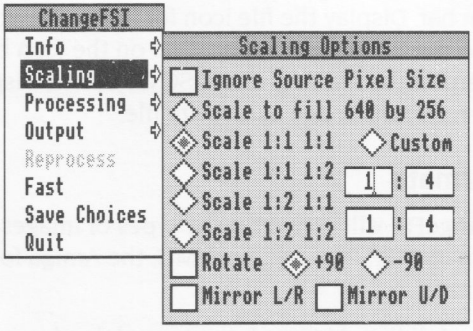
Menu options

Once you have loaded ChangeFSI onto the icon bar, click Menu over the icon to display the main options menu.



Scaling options

The **Scaling** options allow you to choose which scale you wish for your image. You can also transform, rotate or mirror the image.



The option **Scale 1:1 1:1** will give you a full sized image.

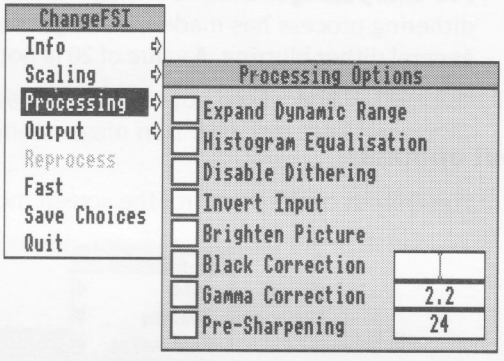
Choosing **Custom** allows you to specify your own scaling options. If you wish the image to 'scale to exact pixel size', fill in the left boxes only and leave the right boxes blank. The **Scale to fill** option allows you to scale the image so that it covers the entire screen area; this may distort the aspect ratio of the image.

The **Ignore Source Pixel Size** box allows you to ignore any source information about the pixel size. This can be useful if you have images that use a non-standard pixel size.

The **Rotate** and **Mirror** options perform rotations and mirror operations on the source image.

Processing options

The Processing options allow you to control the image processing used in the conversion and display of the image.



You'll notice that all of these options are 'off' by default; you will not normally need to change these settings.

Expand Dynamic Range will expand the range of colours in the image. This normally brightens the image. It expands the dynamic range of a picture to full scale.

Histogram Equalisation will most often result in a worse picture but it can be used to recover detail from an otherwise useless image. Alternatively you can use it to look at information locked in a small part of the input scale.

Disable Dithering will disable Floyd-Steinberg dithering. This will usually result in an inferior image.

Invert Input will result in your colour images having their colours inverted. Black and white image are also inverted.

Brighten Picture will produce a picture that is slightly brighter than it should be. Useful if you have dark pictures.

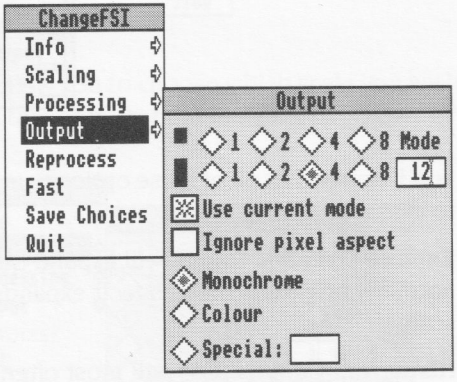
Black Correction is useful if you want to print the image on a laser printer. You should use a number between zero and 128, though values between 32 and 64 usually give the best result; experiment. Images treated in this way will give a poor result when viewed on screen. Only works for 1 bpp (black and white) output.

Gamma Correction is used to correct the image quality as displayed on your monitor. Low values of gamma (0 to 1) make colours darker and high values (above 1) make them lighter. Gamma correction is most often used to correct images that have been scanned in with a scanner. Different monitors may need different Gamma Corrections. A standard value is 2.2 (TV industry standard).

Pre-sharpening is used to sharpen the edges of objects. This is useful if the dithering process has made the image blurred. A value of 24 will counteract the general dither blurring. A value of 20 is noticably sharp. Values down to nine can be selected.

Output options

The Output options control the screen mode the picture is created for.



The **1, 2, 4, 8** buttons represent the screen colours that you can use. The numbers represent bits per pixel. 8 bits represent 256 colours, 4 bits represent 16 colours, 2 bits represent 4 colours and 1 bit represents 2 colours. The square box represents the square pixel modes and the oblong box represents the non-square modes. The actual output mode chosen is displayed in the mode box.

Use current mode outputs the image for display in the current mode.

Ignore pixel aspect disables all pixel size information and assumes both source and output pixels are square.

Monochrome and **Colour** give an image in black and white or colour.

Special allows the use of special file suffixes. These are explained fully in the on-line documentation file FSII*nfo*.

Reprocess

This option reads the file in again and processes it according to any new options you have set.

Fast

This option speeds up the processing of the image by blanking the screen during processing.

Save Choices

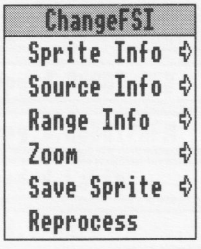
This option will save any changes you have made to the ChangeFSI options so that you can use the options again next time you run ChangeFSI.

Quit

This quits the application, removing it from the icon bar.

Image menu

Once your image has been produced you can click Menu over the image to display a menu of information about the input and output image.



Sprite Info gives the information about the Sprite output file.

Source Info gives the information about the source file.

Range Info gives you information about the dynamic range of the image.

Zoom allows you to change the magnification of the image. This is not the same as scaling the source image.

Save Sprite allows you to save the image as a Sprite file.

Reprocess allows you to process the image again using any options you have changed on the main menu.

19 T1ToFont

T1ToFont is a program that converts fonts in Adobe Type1 format to the RISC OS outline font format. Once the fonts have been converted they can be used just like any other Acorn outline font.

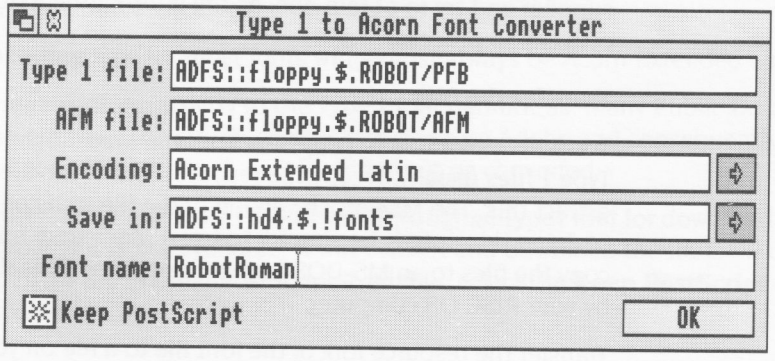
You may only use this application to convert public domain fonts. While it is possible to convert proprietary fonts, it would, most probably, be a breach of copyright to do so without the consent of the copyright holder.

Converting your font

Before you can use the converter you need to have the Type 1 file and the AFM file on a RISC OS disc. The Type 1 file should be given the filetype PoScript and the AFM file given the filetype Text.

Starting the application

Double-click on the T1ToFont icon; this loads the program and displays its icon on the icon bar. Click on the icon to display the Font converter window.



Converting a font

1. Drag the Type 1 file icon from its directory display onto the converter window. The file name is displayed in the **Type 1 file** field.
2. Drag the AFM file from its directory display onto the converter window. The file name is displayed in the **AFM file** field.

3 After a few seconds the name of the RISC OS font to be generated is displayed in the **Font name** field. You can change this name if required.

4 Use the **Save in** field to select a font directory to save the resulting font in. Click on the left arrow to display the alternatives.

5 Select the **Encoding** you need for the font, **Acorn Extended Latin** is nearly always used. Click on the left arrow to display the alternatives.

6 Click on the **Keep PostScript** option button if you want to keep the Type1 font and the AFM files with the Outline font. This is useful if you are printing to a PostScript printer as the printer will use the PostScript font directly.

7 Start the conversion by clicking on **OK**.

Macintosh fonts

Macintosh fonts are generally supplied as a Font/DA Mover document, containing the Macintosh version of the font, and one or more Type 1 files containing the PostScript code for use on the printer. There will be one Type 1 file for each weight and variation of the font.

AFM file

In addition to this you need an AFM (Adobe Font Metrics) file for each weight and variation of the font. The Macintosh does not seem to use this itself, but some fonts are supplied with it anyway. If you do not have the AFM file, contact the font supplier and try to obtain one, as the information in it is essential to the conversion process.

Transfer the files

You will need a way to copy files from the Macintosh to your computer. Macintosh Type 1 files usually occupy the resource fork of the file, so you'll need a way to extract this. The Macintosh version of the file transfer protocol Kermit, is one way of doing this. It may be simpler to use a Macintosh multiformat floppy drive to copy the files to an MS-DOS format floppy disc. This disc can then be read directly by your RISC OS computer.

Transfer the resource fork of the font file to a file on your computer, and set its filetype to PoScript (&FF4). Transfer the AFM file (usually in the data fork) to your computer and give it the filetype Text.

MS-DOS Fonts

Fonts for MS-DOS computers are supplied on MS-DOS floppy discs and can therefore be read directly by the RISC OS Filer. Among the files on the disc will be one or more Type 1 files containing the PostScript code for the printer. There will be one Type 1 file for each weight and variation of the font. The Type 1 files usually have the extension ".PFB".

AFM file

In addition to this you need an AFM (Adobe Font Metrics) file for each weight and variation of the font. If you do not have the AFM file, contact the font supplier and try to obtain one, as the information in it is essential to the conversion process.

Other files on the disc, including the PFM file, are not needed for the conversion.

Setting the filetypes

Transfer the AFM and PFB files to another disc. Change the filetype of the PFB file to PoScript (&FF4) and the filetype of the AFM file to Text.

Other information

The **Save in** menu selects a font directory to save the resulting font in. The menu is constructed from the contents of the Font$Path system variable, so !Font directories can be added to the menu by installing them on Font$Path (usually achieved by double-clicking them).

The **Encoding** type for most fonts will almost always be Acorn Extended Latin.

Fonts must conform strictly to the Type 1 font definitions. Many Public Domain fonts do not obey the structure rules laid down by Adobe and consequently they may not convert properly. Type 3 fonts cannot be converted.

The printer module, PDriverPS, will use the original Type1 font for downloading if it is available. If it is not available, it will convert and download the RISC OS outline font. To make the original PostScript available, select the **Keep PostScript** option when converting.

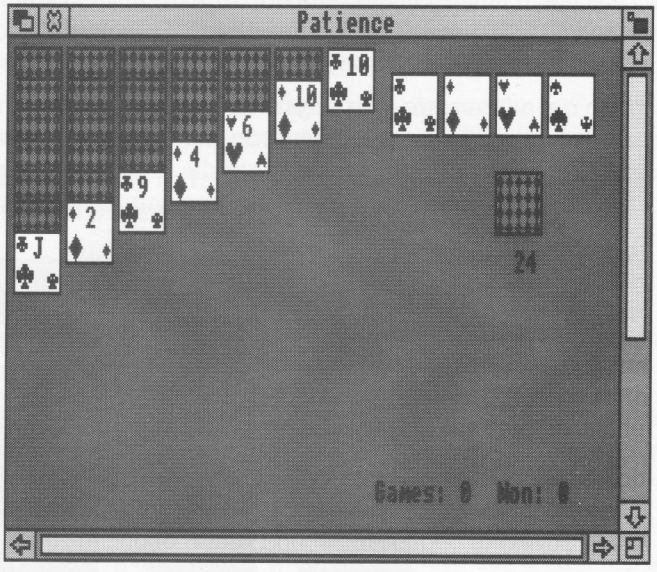
Part 4: Entertainments

20 Madness

To activate Madness, double-click on the Madness icon. A small window labelled Madness will appear in the bottom lefthand corner of the screen. All the other windows will start to drift around the screen. When you get tired of this, turn Madness off by clicking the Close icon in the Madness window.

21 Patience

This version of Patience is probably the best-known version of the familiar solo card game. To play the game, double-click on the Patience icon in the directory display, then click again on the icon in the menu bar. The Patience window appears on the screen, displaying something like the following:

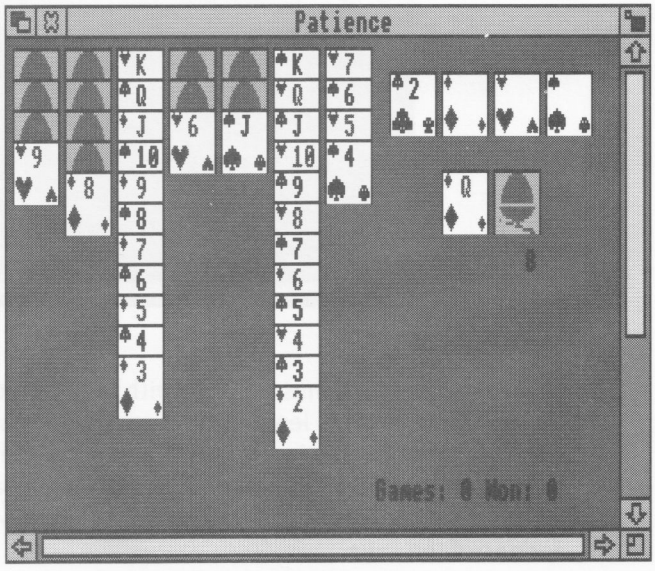


There are seven columns of cards, with the bottom card in each column turned up. The columns range in length from seven cards (on the left) to one (on the right). The rest of the pack is in a face-down 'pile' on the righthand side of the screen. A number below the pile tells you how many cards are face down. At the top righthand corner of the screen are four card outlines, each marked with the symbol for one of the suits.

Rules of Patience

The object of the game is to place all four suits on top of their symbol in ascending order, starting with the ace and finishing with the king. To do this, you must reveal all the hidden cards by going through the pack and building chains of cards. Here are the basic rules:

- The chains you build downwards from each column must be in descending order (king, queen, jack, ten, nine, eight, seven, and so on) and must alternate between red and black suits (ten of hearts, nine of spades, eight of diamonds, seven of spades, for example). If you try to place a card incorrectly, the computer will refuse to move the card.
- When you move the top card from one column to another, the next hidden card is automatically turned up. You can move all or part of a chain to another column.
- There are only seven columns allowed in the game. If you have used up all the cards in one column you can only start a new column with a king.
- Once you have placed a card on one of the suit symbols (in ascending order) at the top righthand corner of the screen it cannot be taken off again.



Playing Patience

To play the game, proceed as follows:

1. Look at the cards which are revealed at the bottom of each column. If a card can be moved, use the mouse pointer to click on it and drag it to the correct place. When you release the button, the card will be in its new place and the next card turned up in the column where it came from. Continue this procedure until you have no more cards that can be moved.
2. Click on the pile of cards on the right, to reveal the next card (every third card in the pile is turned over). If you can use it, drag the card to the appropriate column. You may now be able to move one or more cards from one column to another. If you can't, click on the pile of cards again. If you can't use a card, continue clicking on the pack until one is revealed that you can use. When you use a card from the pack, the card beneath it is again revealed.
3. As soon as an ace is revealed, drag it to its place at the top righthand corner of the screen (alternatively, clicking Adjust on a card that can be added to one of these stacks automatically moves it to the correct stack). You can then start building (in ascending order from ace to king) as the cards that follow come up.
4. Continue going through the pack and moving cards. The number of cards left in the pack will continue to be indicated by the number below it. A grey rectangle indicates that you have gone through the pack once; click on it to go round again.
5. If you can't go any further and want to see where the hidden cards were, click Menu and choose **Resign**. If there are any cards left in the pack, you can see what they are by clicking on the pack; this will display each card in turn.

If you want to start a new game, choose **Deal hand** from the menu. If you do not wish to continue playing Patience, click on the Close box on the top lefthand corner of the window to finish.

Varying the rules

You can vary the rules in two ways to make the game easier or harder, using two options displayed when Menu is pressed. These options are both on by default.

- **Only Kings** means that no cards other than Kings can be placed in empty columns. Switching this off makes the game very much easier; you can now move any card into an empty column.
- **Rev. Cards** refers to the process by which cards are turned over from the pack. The default is that when a group of three cards is turned over, their order is reversed as they are moved. This means that if you run through the pack twice,

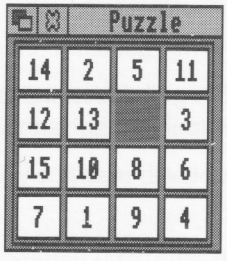
you will see two-thirds of the cards. Switching off **Rev. Cards** means that the cards are not reversed, so you will only see one-third of the cards, making the game much harder.

Varying the Pack

You can vary the design on the reverse of the cards by clicking on **New Pack** at any time during the game.

22 Puzzle

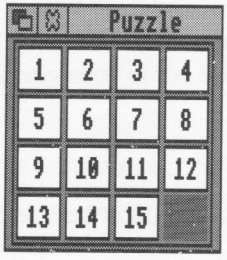
Puzzle is a simple tile puzzle. To play Puzzle, double-click on the Puzzle icon. The Puzzle window appears in the display.



The puzzle comprises fifteen number tiles and one space in a four-by-four grid. The object of the puzzle is to move the tiles into numerical order in four lines from the top left to the bottom right. Rearrange the tiles by clicking on any of the number tiles next to the space to move it into the gap.

To display a new grid, press Menu and choose **New board**.

If you want to learn how to solve the game you should look at the Help file supplied with the application. Here is what the completed puzzle looks like.



End-user licence conditions for the RISC Operating System

1. Definitions

The following expressions have the meanings given here:

'Acorn' means Acorn Computers Limited, being either owner of all intellectual property rights in the Software, or having the right to grant licences of the Software.

'Developer' means any third party software developer who retains copyright in the Software.

'Software' means the operating system programs, applications, utilities and modules supplied in and with this product.

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